THE 1983 EXCAVATIONS AT 19BN281

Chapters in the Archeology of Cape Cod, II

Cultural Resources Management Study No.12

Division of Cultural Resources
North Atlantic Regional Office
National Park Service
U.S. Department of the Interior
1985

Cover Photo: Excavations at 19BN281, Autumn, 1983

The 1983 Excavations at 19BN281

Christopher L. Borstel

Chapters in the Archeology of Cape Cod, II

Francis P. McManamon, Series Editor

Cultural Resources Management Study No. 12

Division of Cultural Resources

North Atlantic Regional Office

National Park Service

U.S. Department of the Interior

Boston, MA 1985

EDITOR'S FOREWORD

Chris Borstel's report on the excavations and analysis of 19BN281 is the second report in our series reporting the results of the Cape Cod National Seashore Archeological Survey. Chris has produced a detailed description, meticulous analysis, and careful interpretation of the data. We hope to provoke other archeologists to use and test these data, approaches, and interpretations.

The 1983 excavation at 19BN281 on High Head and another 1983 excavation at 19BN308 on Fort Hill in Eastham would have been impossible without the decision by the National Park Service to extend the Cape Cod project by one year. The extension was justified on the basis of the likely high significance of the archeological resources and the need for relatively extensive excavations to confirm this and provide data for comparison with existing archeological data in the Northeast. Superintendent Herbert Olsen, Associate Regional Director Charlie Clapper, and Regional Director Herbert Cables deserve credit for making the decision to extend the project. The data from the 1983 excavations substantially improves the Service's ability to manage and interpret these resources. Support for the extension by Chief Anthropologist Doug Scovill, Rowland Bowers, and Associate Director Jerry Rogers also is acknowledged with gratitude.

The final production of this report is evidence of the diligence, skill, and perseverence of Deborah Chapman. Through her efforts a rough manuscript with text, tables, and figures scattered among various computer files, map drawers, and folders was molded into the final copy presented here. She has the sincere gratitude and appreciation of the author, editor, and, I am certain, the readers for her time and energy on this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

Since 1979 the National Park Service has been conducting an archeological survey of Cape Cod National Seashore. This report describes the results of excavations at one site during the 1983 field season. The report is preliminary in the sense that it is the first examination of the materials recovered. Not every idea has been followed through; not every analysis is complete.

Many people helped during the excavation and analysis of the site, and I am pleased to acknowledge their assistance. The support provided to the survey by Herbert Olsen, Superintendent, Cape Cod National Seashore, and his staff has been invaluable. Frank McManamon, Chief, Division of Cultural Resources and principal investigator for the survey, has been supportive and more than patient about the production of this work. The work of the 1979 and 1980 field crews and that of laboratory workers from 1979 through 1983 laid the foundation for the 1983 field season. The 1983 field crew consisted of Steve Butler, Alison Dwyer, Fred Markham, Jim Mullen, Matt Oldale, and Susanne Spano. Their hard work and careful record keeping provided quality materials for this study. Larry Poppe of the U.S. Geological Survey, Woods Hole, MA, provided grain analyses.

Thanks go to my colleagues at the Eastern Archeological Field Laboratory in Charlestown, Massachusetts, for making it an enjoyable workplace. The cheerful assistance of Alison Dwyer in the field and laboratory has made my task both easier and more pleasant. George Stillson drafted the illustrations, doing, as always, first-class work. Debbie Chapman turned a fragmented text into this nicely finished manuscript. Debbie, Alison, and George were kind enough to see to the final details of preparation following my departure to Indiana University.

The comments of Alison Dwyer and Frank McManamon on the manuscript helped me clarify both my thinking and my writing. Arthur Spiess reviewed the faunal analysis section and provided several helpful comments.

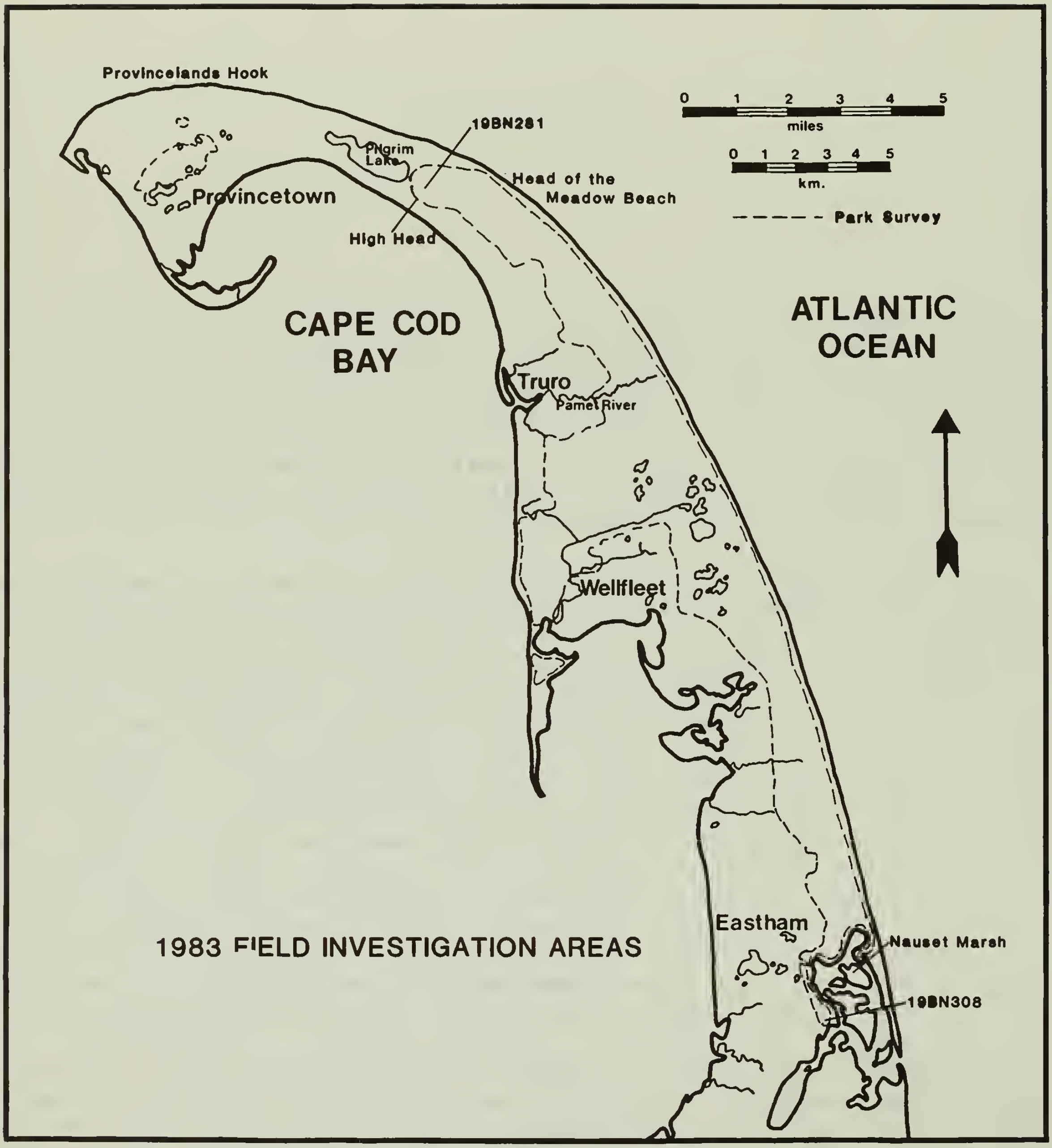
Finally, Innes Borstel has put up with the author's crankiness and has given much needed encouragement.

CHAPTER 1

Introduction

Site 19BN281 is a Late Archaic habitation near High Head (Pilgrim Heights) in North Truro, Massachusetts. The site is on land of Cape Cod National Seashore in the town of Truro. It is located at lat. 42 03′05" N long. 70 06′30" W. This area is shown on the U.S. Geological Survey′s North Truro 7.5 min quadrangle map. The site is near the outer end of Cape Cod, where the land narrows to a width of two kilometers before expanding again to the northwest (Figure 1.1).

The site was discovered and tested as part of the National Park Service′s general archeological survey of the seashore. In the context of the survey′s results, 19BN281 is of interest for several reasons. First, 19BN281 is virtually a single component Late Archaic small stemmed point tradition (Squibnocket complex) site. In this respect, the site differs from most other archeological localities on outer Cape Cod, which are typically multicomponent sites and are often dominated by evidence of Middle and Late Woodland occupancy. Second, much of the site is buried beneath a layer of aeolian sand. This sand blanket appears to have reduced the disturbance the site suffered resulting from historic period agriculture and uncontrolled collecting. Parts of the site have never been plowed so the stratigraphy and artifact distributions at 19BN281 are in better condition than at most other prehistoric localities on the outer Cape. In addition, unlike most other prehistoric sites examined by the National Park Service survey (e.g., 19BN308 at Fort Hill--Fitzgerald [1984]), 19BN281 has no dense shell deposits. Finally, the location of 19BN281 and the spatial pattern of which it is part are unusual. At Nauset Marsh and Wellfleet Harbor, sites are strung along bay and marsh shorelines in a linear fashion, and they rarely extend more than a couple of hundred meters inland from the shore. Site 19BN281 is several hundred meters from the nearest salt water or tidal marsh. The site is also part of a dispersed (non-linear) distribution of archeological localities at High Head. However, it is presently unclear whether 19BN281 is a discrete archeological entity or



Provincelands Hook
19BN281
Pilgrim Lake
Head of the Meadow Beach
Provincetown
High Head
0 1 2 3 4 5
miles
0 1 2 3 4 5
km.
Park Survey
CAPE COD BAY
ATLANTIC OCEAN
Truro
Pamet River
Wellfleet
Eastham
Nauset Marsh
19BN308
1983 FIELD INVESTIGATION AREAS

FIGURE 1.1

whether it is merely a dense patch in a continuous scatter of artifacts that covers many tens of hectares at High Head.

These characteristics mean that 19BN281 has the potential to inform archeologists about some facets of Late Archaic lifeways better than most other sites in the seashore. Because of the large field effort invested in this site, it should be possible for the first time to develop a picture of the Late Archaic small stemmed point tradition on the outer Cape. This report describes and analyzes the results of excavations at 19BN281 and focuses particularly on the results of the 1983 field season. It provides a detailed study of the stratigraphy and artifacts at a single prehistoric site and in this way complements other, more synthetic, reports (McManamon 1982, 1984) on the results of the archeological survey at Cape Cod National Seashore. The report is guided by questions about several aspects of the site and lifeways of its former occupants:

1. Chronology. When was the site used, and were all parts of the site used at the same time?

2. Use of space. Did the people who lived at 19BN281 use all parts of the site in the same way?

3. Function. Why did people live at 19BN281, and what did they do while they stayed at the site?

4. Site formation. How did 19BN281 evolve from a place inhabited by hunters and gatherers several millenia ago to the archeological entity it is today? Particularly, what is the origin of the aeolian layer, and what are the possibilities that such buried sites occur elsewhere in the seashore?

Obviously, answering some of these questions requires looking not only at 19BN281 but also at other sites on the outer Cape and beyond.

Site Setting

The ways in which ancient people used a place depended partly on its setting--its physiography and vegetation, its resources, and the accessibility and proximity of resources and features in the surrounding landscape. The present setting of 19BN281 (Figures 1.2-1.3) differs in some respects from that of four millenia ago. However, the present setting provides some keys to the Late Archaic landscape at High Head and indicates the conditions under which the fieldwork was carried out. The physiography and vegetation of the area when the site was occupied are taken up in Chapter 4.

Figure 1.2. Looking north, area of 1983 excavations in the middle distance.

Figure 1.3. Area of 1983 excavations at 19BN281.

Geological Setting

High Head marks the northernmost extent of glacial drift on Cape Cod. The area is part of the Truro outwash plain which is one of the youngest units of late Wisconsinan drift on the Cape (Koteff et al. 1967; Oldale 1976:13, 1982:28). The Truro plain was deposited by meltwaters from the South Channel glacial lobe as a westward dipping delta. The delta extended into a proglacial lake that filled the present basin of Cape Cod Bay. Some parts of the plain are pitted by kettle holes left when blocks of ice trapped in the drift melted away. Superimposed on the outwash plain topography are recent hillocks and ridges, the surface of a sand sheet that covers at least the area between the western edge of the drift and the site. Sediments of the Truro plain are primarily sands and gravels, and the soils developed on them are excessively well-drained podzols (Soil Conservation Service 1980, 1982).

Stretching northwest of High Head is the Provincelands Hook. The hook is formed of sediment eroded from the glacial drift, and it has been building since 6000 or 7000 BP (Zeigler et al. 1965:R310). The Provincelands have several ridgers of active parabolic dunes. At the time of European colonization, the dunes were stabilized beneath a mature forest, but land clearing disrupted this cover and allowed the sands to begin moving (McCaffrey and Leatherman 1979).

Physiography

The sea is all around 19BN281. To the north, east, and southeast is the Atlantic Ocean. Near at hand on the west is Provincetown Harbor, including the shallow and eutrophic Pilgrim Lake, which at one time was a quiet, deep cove called East Harbor. On the south and southwest, and beyond the protective curve of the Provincelands Hook on the west, is Cape Cod Bay, the southern end of the Gulf of Maine. Outer Cape Cod, trending a little west of north from Chatham, then curving more strongly northwest beyond High Head, divides the Atlantic from Cape Cod Bay. In a northeasterly direction 19BN281 is as little as 1.4 km from the ocean. In this direction, however, the ocean lies beyond marshes that surround Pilgrim Lake and across the dunes of the Provincelands Hook. The nearest direct access to the ocean is at Head of the Meadow Beach, 2.5 km to the east. The site lies only 0.6 km northeast of Cape Cod Bay, and the open water of Pilgrim Lake (beyond a short stretch of marsh) is 0.9 km west northwest.

The site stands at an altitude of 14-18 m (45-60 ft) ASL. To reach the marshes, bay, or ocean from 19BN281, one must in most places descend an escarpment that arcs around this site from southwest to north to east-northeast. The scarp is a relict feature of mid-Holocene marine erosion; as the Provincelands Hook developed, this section of cliffs became protected from the

waves. The relict marine scarp is intersected by presently eroding cliffs at Head of the Meadow Beach on the ocean side and at the eastern end of Pilgrim Beach on the bay side.

The nearest point on the relict escarpment is 400 m southwest of 19BN281. From the top of the cliff one can see much of the shoreline of Cape Cod Bay in good weather. The view stretches from Provincetown Harbor on the west along a great arc south and west until the shoreline disappears below the horizon beyond Sandy Neck in Barnstable. One can also look to the west-southwest across the spit at Wood End in Provincetown. Low on the horizon beyond the spit, and across 50 km of Cape Cod Bay, rises Pine Hill in Manomet. The hill is a landmark that could have guided prehistoric boatmen across the bay. Visible to the north and east beyond the dunes of the Provincelands Hook is the broad Atlantic, its surface forever changing beneath the wind and the sky.

The topography of the site rolls gently. The land slopes southeasterly all the way from the cliff edge to a broad shallow swale. Small hillocks and ridges, rising 25 cm to 2 m above the surrounding ground interrupt the general slope of the land. The northern end of the swale is marked by a three-meter-deep kettle hole that has a diameter of about 80 m. The swale trends south-southwest and converges with several others in a steeply pitched bit of ground about 400 m south of the kettle. East of the swale is a low ridge of higher, somewhat broken, land. Looking along the axis of the swale one can glimpse Cape Cod Bay beyond the cliff edge. The Atlantic Ocean is not visible from the site because of higher ground to the north and east. This higher ground also provides some protection from northerly winds, for it is more comfortable at 19BN281 on a breezy autumn day than in the full force of the wind along the scarp edge.

Vegetation

The land is open from the site west and north to the scarp. The shrubs, heaths, grasses, and lichens form a mosaic vegetation pattern, which also includes small clusters of trees, predominantly pitch pine (*Pinus rigida*) (Figure 1.2). This mixed community of plants is a stage in the succession from bare ground to climax forest. The structure and composition of the community are largely the result of ground disturbances by timbering and farming between the mid-seventeenth and early - twentieth centuries. A few hundred meters east of 19BN281 the shrubland-heathland gives way to pine-oak woods.

Common plants at 19BN281 include: pitch pine, bear (scrub) oak (*Quercus ilicifolia*), pin (fire) cherry (*Prunus Pensylvanica*), bayberry (*Myrica pensylvanica*), blueberry (*Vaccinium* spp.), bearberry (*Arctostaphylos uva-ursi*), beach plum (*Prunus maritima*), common elderberry (*Sambucus canadensis*), prickly dewberry (*Rubus* spp.), broom crowberry (*Carcina*

conradii), downy hudsonia (Hudsonia ericoides), hair grass (Deschampsia flexuosa), little bluestem (broom) (Andropogon scoparius), beach grass (Ammophila breviligulata), reindeer lichens (Cladonia spp.), and Iceland lichen (Cetaria islandica). Much to the discomfort of archeologists, poison ivy (Rhus radicans) is also present, most commonly beneath bayberry bushes.

History of Research

In the summer of 1979 the National Park Service began fieldwork for an archeological survey of Cape Cod National Seashore. This survey is the first systematic, professional study of the park's archeology. It significantly refines the information included in the 1962 report of Provincetown archeologist Ross Moffett (Moffett 1962). The survey's objectives are isolation of major patterns in the distribution of site locations, evaluation of the condition of sites, description and analysis of the structure and contents of sites, and evaluation of site significance. The results of the survey will help the seashore's staff to better protect, manage, and interpret these cultural resources. The goals and strategies of the survey have been summarized in detail by the project director, Francis P. McManamon (1984a).

The history of research at 19BN281 follows a sequence similar to the survey's work at several other large prehistoric sites: discovery and initial testing, followed by test excavations, and finally a block excavation. At each stage of fieldwork, both site-specific problems and questions of wider geographic import have been addressed; each phase of work has raised new questions as well as answering the old ones. Although the sequence of fieldwork at 19BN281 is typical, the site was the first where survey crews used excavation units. This means that test excavations at 19BN281 differed in some details of strategy and procedure from work at other sites.

Site Discovery (1979)

McManamon's research design employed stratified sampling to describe the patterns of site distribution and general content. This sampling design was applied to about 5880 ha of the park's 18,050 ha, those areas above the high tide line that are not covered by ponds, marshes, or thick sand dunes (McManamon 1984b:26).

Sample Unit 31 was one of 21 quadrats in Stratum II, that section of the sampling universe more than 200 m from a present or former body of water. It was tested in July 1979 by a crew under the supervision of David Lacy. Lacy's crew dug 103 shovel tests (ST's), and they discovered a prehistoric site in a buried soil layer. The site was assigned the number 19BN281 in the

survey's records; like most of the sites the survey identified, it did not receive a name.

Sample Unit 31 falls within an irregularly shaped area of about 70 ha that is recorded in the files of the Massachusetts Historical Commission as 19BN159, the Pilgrim Heights site. Ross Moffett, and others, apparently collected in this area, but no one published a description of the site. To avoid potential confusion, the reader should be aware that the designation 19BN281 is used only to refer to the archeological entity in Sample Unit 31 and contiguous areas that were examined as part of the National Park Service's archeological survey.

The 1979 shovel tests recovered two classes of artifacts in abundance: fire-cracked rock and chipped stone artifacts (lithics). The 596 lithics excavated in 1979 included 12 bifaces, none of which were diagnostic. Ninety-four percent (560) of the assemblage was quartz. The tests showed that the site covered most of Sample Unit 31 and that 19BN281 extended beyond the quadrat's boundries. Highest lithic frequencies were in an area south and southwest of the kettle hole. Moderate frequencies occurred west and north of it. During the analysis of the 1979 data, these two portions of the site were designated 19BN281b and 19BN281a, respectively. Comparisons with other assemblage areas in the park indicated that 19BN281 had high densities of both lithics and fire-cracked rock (McManamon 1982:Figure 7; in Figures 4 and 5 of that paper 19BN281a and b are assemblages 44 and 45, respectively). In addition, 19BN281 stood out not only because of its size and the density of materials, but also because of its location in Stratum II, where sites were rare overall.

Test Excavations (1980)

In 1980 the survey began a new phase of work, then called "site examination," in which crews returned to some sites and conducted further testing at them. The author's own work with the Cape Cod National Seashore survey, and specifically at 19BN281, began with this stage of the investigations. This phase was intended to increase the size and diversity of artifact samples from selected sites, to gather suitable samples for radiocarbon dating, and to improve the understanding of the structure (stratigraphy, features, and intrasite artifact distributions) of sites. Site 19BN281 was the first selected for additional testing. McManamon chose the site because of its size and location. The site was accessible but not too near any visitor facilities, and the site was at worst "shrubby", making for easy working conditions.

Since 19BN281 was the first site to be tested with excavation units, the survey's excavation procedures and strategies were refined at it. The 19BN281b area was tested with

a stratified nonaligned random design using 50 cm x 50 cm excavation units (EU´s). Corridors were added east and west of Sample Unit 31 in an attempt to determine the boundaries of the site. The crew experimented with both natural and arbitrary excavation levels and with different screen mesh sizes. Because 19BN281 was a sort of proving ground for developing the site examination strategy, it received more than a typical share of field time in 1980. In addition, the stratified nonaligned sampling design was used more extensively at it than at any other site studied by the survey.

Excavations began at 19BN281 on 18 June 1980 with a crew of 11 under the joint supervision of the author and Elena Filios. Work continued until 31 July; after 14 July half the crew began testing additional sample units and Borstel was left in sole charge with five crew members. At the conclusion of the 1980 work, the crew had excavated 161 50 cm x 50 cm excavation units and three 1 m x 1 m units --a total of 43.5 square meters.

Other than refining survey´s excavation procedures, the 1980 excavations at 19BN281 had several results. First, the excavations established the nature of the sand layer above the artifact-bearing layer. The excavations clearly showed that the sand was aeolian, but did not identify either the source and age of the sediment. Second, the excavations seemed to indicate that, with the exception of a few isolated patches, the site had never been plowed. Third, the excavations provided evidence that the site was essentially a single-component Late Archaic site. The 1980 lithic assemblage was, like that of the STP grid, about 94% quartz, and the testing recovered a number of small stemmed points. Ten excavation units produced tiny potsherds suggestive of a minor Woodland component. Unfortunately, excavations encountered no features and produced little material suitable for radiocarbon dating. Fourth, the excavations recovered 8225 lithics (>0.25 in) and 16.8 kg of fire-cracked rocks, which allowed the distribution of artifacts across the site to be mapped in more detail. Finally, the efforts to delimit the east and west boundaries of the site were partly successful.

The subsequent laboratory study of 19BN281 used data from both field seasons. To map the distribution of artifacts across the site, lithic frequencies, weights of fire-cracked rock, and weights of shell were converted to constant volume densities. After some experimentation McManamon found that quartiles provided useful isopleth values for mapping (McManamon 1984c:53-57). Plotted in this way, the general pattern of artifact density at 19BN281 became apparent. High artifact densities occur in a broad, curved band that trends southwest from the southern edge of the kettle hole. Both fire-cracked rock and lithics show this pattern, and both artifact classes have a few outliers of high density beyond the major band. Very little shell comes from the site. McManamon (1984c:87-90) divided the pattern into 27 geographic subdivisions called concentrations (Figure 1.4).

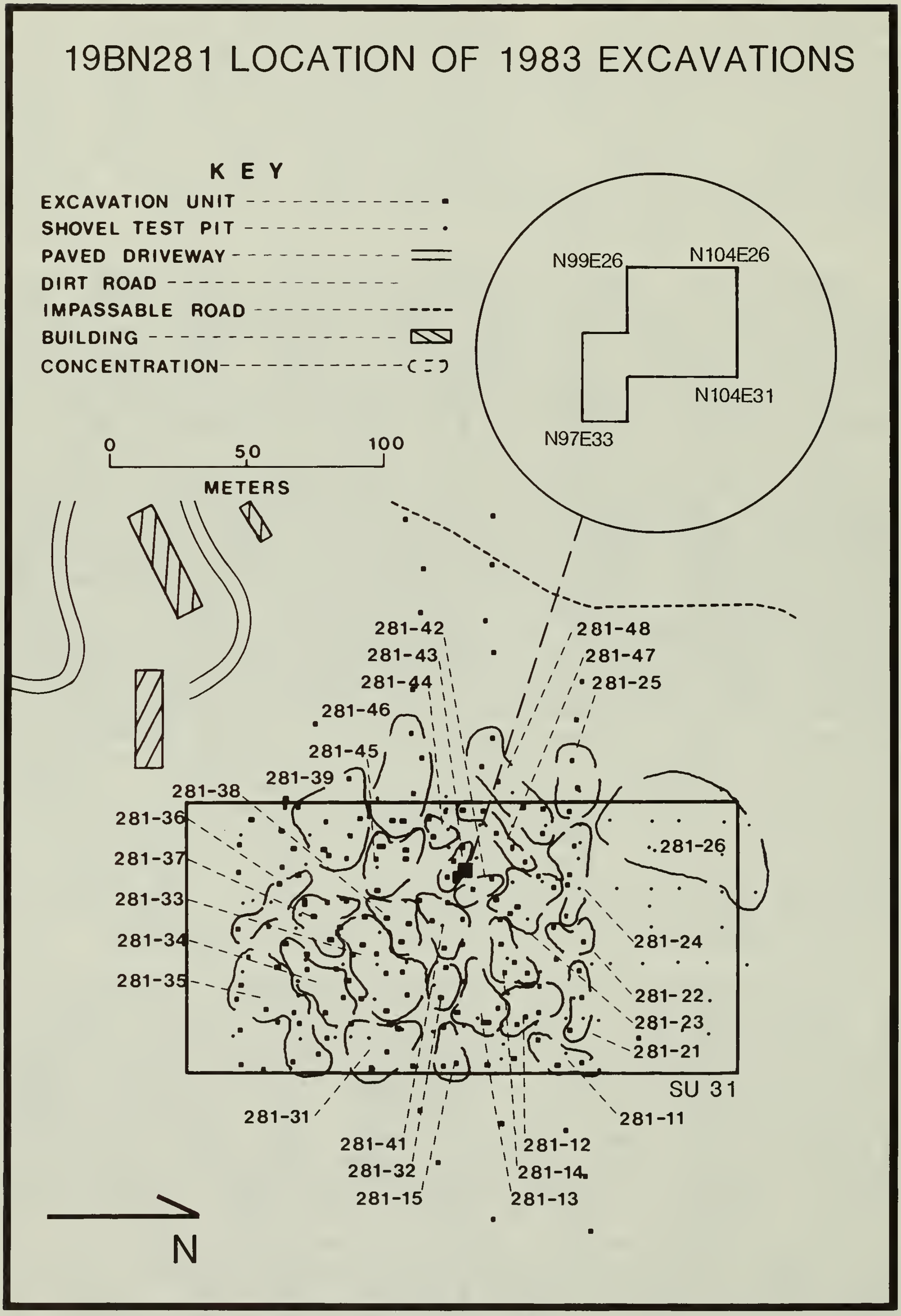

19BN281 LOCATION OF 1983 EXCAVATIONS
KEY
EXCAVATION UNIT
SHOVEL TEST PIT
PAVED DRIVEWAY
DIRT ROAD
IMPASSABLE ROAD
BUILDING
CONCENTRATION
0
50
100
METERS
N99E26
N104E26
N104E31
N97E33
281-42
281-43
281-44
281-46
281-45
281-39
281-38
281-36
281-37
281-33
281-34
281-35
281-48
281-47
281-25
281-26
281-24
281-22
281-23
281-21
SU 31
281-11
281-31
281-41
281-32
281-15
281-12
281-14
281-13
N

FIGURE 1.4

McManamon's (1984e) study of the artifact patterns at 19BN281 identified six concentrations as primary deposits produced by a limited range of prehistoric activities, 13 concentrations as primary deposits produced by a wide range of activities, and eight concentrations as having assemblage sizes too small for classification (1984e:Table 16.17). As McManamon used the term, primary deposits "are those laid down at the time of the activity that generated them and not moved subsequently" (1984d:2); he distinguished the range of activities on the basis of the diversity of artifacts in the deposit. McManamon interpreted the pattern of artifacts to be the result of overlapping, repeated, small, short term occupations, "probably mainly or exclusively for subsistence" (1984e:383).

Block Excavation (1983)

During the final field season of the survey, work focused on just two sites, 19BN308 at Fort Hill in Eastham and 19BN281 (Figure 1.1). At each, excavations intensively examined small portions of the site. McManamon, Joyce Fitzgerald, and the author selected 19BN281 because of the many questions it raised and because of its potential for characterizing the Late Archaic small stemmed point tradition on the outer Cape. Specifically, the work at 19BN281 had four objectives. First, the excavations sought to establish the age and depositional history of the overlying aeolian sand. Second, the work was to improve the chronology at the site by establishing the relationship between the ceramics and the quartz assemblage and by (once again) attempting to recover samples for radiocarbon dating. Third, the excavations sought to enlarge the known range of Late Archaic cultural materials from the site (e.g., faunal material, rare types of stone tools). Finally, the work was to address the questions of site formation and function.

Excavations had to be completed within strict time and manpower constraints. A 5 m x 5 m block was an efficient way to use the available resources, and the block had the best potential for answering a range of questions about the site. After a review of the previous excavations and a field inspection, the author placed the block between N99 and N104, E26 and E31, within concentration 281.43 (Figure 1.4). Excavations began on 20 October 1983 and ended on 14 November. The weather cooperated and the crew worked quickly. Not only did the excavators finish the initial 25 square meters, but there was time to add a 2 m x 4 m extension on the southeastern corner of the block, for a total contiguous area of 33 square meters (Figure 1.5). As will be described in the following chapters, the excavations achieved some of the goals, but not others.

Site Sampling Strategies

Each season of fieldwork at 19BN281 employed a different sampling design--systematic (1979), stratified nonaligned random (1980), and judgmental (1983). Different designs were used because the objectives of each season's work were different, and taken together these designs provide complementary kinds of information about 19BN281.

All of the survey's initial sample unit shovel test pit grids followed the same sampling design (McManamon 1984b:29-31). Sample units were 100 m x 200 m. The grid consisted of four rows of eight shovel tests on 25 m centers beginning 12.5 m north and east of the southwest corner of the sample unit. Excavators also dug in each cardinal direction an additional "array" ST 12.5 m from each nonsterile shovel test of the basic grid. Crew members dug yet another ST midway between the array and basic grid ST's if the array pit was sterile. These additional ST's helped define the boundaries of sites and increased the artifact samples from sites.

The 1980 site examination used a stratified nonaligned random sampling design (Redman 1974:11). The design at 19BN281 consisted of one randomly selected 50 cm x 50 cm excavation unit for each 10 m x 10 m stratum. This sampling frame was initially placed on a 100 m x 130 m section of Sample Unit 31 (the portion designated 19BN281b). Ten-meter-wide corridors were later added in an attempt to determine the extent of the site east and west of the sample unit. In addition to the randomly selected excavation units, the field chiefs judgmentally placed three. These helped in the excavation of especially thick aeolian sand deposits and provided additional points for mapping artifact distributions. The design provided data that could be used readily for making parameter estimations of various characteristics of the site such as frequencies of artifact types or features. Using a stratified design prevented random clustering of test units (leaving some portions of the site under represented in the sample) and allowed artifact distributions across the site to be mapped. McManamon (1984b:39) chose 50 cm x 50 cm test units because they offered a way of maximizing the number of units excavated. The more units excavated, the higher the precision for parameter estimates compared to the excavation of the same amount of the area with fewer, larger units (Redman 1974:19).

Against these advantages, the stratified sampling design had drawbacks that became apparent as it was applied to 19BN281 (see also McManamon 1984b:39). The randomly selected 50 cm x 50 cm units were time consuming to place accurately on the ground, even under excellent conditions of topography and vegetation at the site. The small size of the units made working in them awkward and gave only postage-stamp views of the soil. The units' small size also meant that they were good for estimating the frequency

of common items like flakes, but poor for discovering rare items or for recognizing phenomena like features. This in itself was not necessarily a drawback, but the objectives of the site examination included discovery of features and recovery of organic samples suitable for radiocarbon dating. Since features are often rare at New England sites, and since radiocarbon samples are commonly taken from feature contexts, the sampling design was not the best for accomplishing these objectives of site examination (see also Nance 1981:152).

The 1980 field season provided information about overall artifact distributions (at a resolution of 100 square meters), so the 1983 excavations sought to expand the data about a limited portion of the site (Redman and Anzalone 1980:284-285). A single excavation block was selected for a combination of reasons. Small scale patterns of artifact distribution are easier to interpret in contiguous excavation areas. Block excavation also increases one's ability to recognize features, although because of reduced perimeter, it may decrease the probability of encountering features. To gain the advantages of large excavation units at 19BN281, areas of 3 m x 3 m had to be opened. With the manpower available, completing 25 square meters of excavation was a realistic goal for the season. Since 25 square meters is a relatively small area, a single 5 m x 5 m block appeared to be as useful as two or three smaller units. Because only a single block was to be excavated, it was placed on the basis of judgment alone.

Review of previous work at the site led to the location of the block in the N100E30 area. The area was suitable because lithics and fire-cracked rock were both abundant. An area with high artifact densities was likely to produce a variety of artifact types, and high artifact densities might mark the area as having been used intensively during the period of occupation. Intensive use of the area increased the possibility that features would be present. The N100E30 area had also produced calcined bone and pottery. A large sample of bone might contribute insights about site function or Late Archaic subsistence, and excavation of additional ceramic would clarify the relationship of the pottery to the Late Archaic component. The area was also advantageous because of its moderate cover of aeolian sand --thick enough to protect the archeological deposits, but thin enough to be removed quickly. Neither variation in percentages of lithic technology types nor abundance of shell needed to be considered. Similar proportions of lithic technology types occur over the entire site, so there was no need to select between contrasting kinds of activity areas. The 1980 data indicated that shell was rarer than calcined bone, and shell and pottery did not co-occur, while bone and pottery did.

Excavation Tecnniques

Provenience System

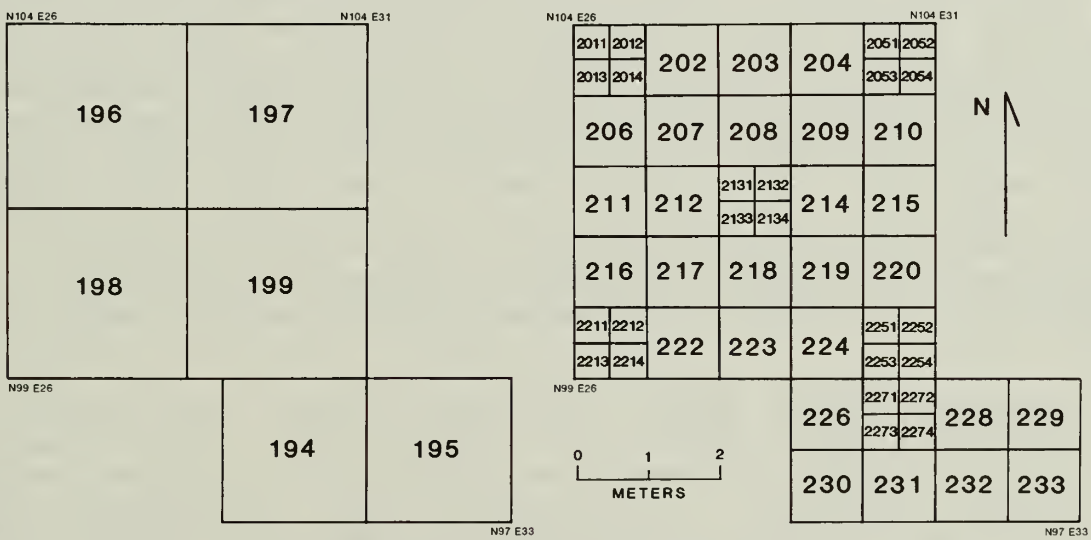
The grid system at 19BN281 is oriented to true north, parallel to the north-south axis of Sample Unit 31. Cartesian coordinates in meters describe the locations at the site. Origin (N0E0) is the southwestern corner of the sample unit. Coordinates of the excavation units are those of the northeast corner of the excavation unit.

The 1979 crew laid out the shovel test grid at the site using pace and compass techniques. The 1980 crew established baselines of wooden stakes using tapes and a theodolite. All excavation units in 1980 and 1983 were placed from these baselines using tapes, tape and compass, or tape and theodolite. In addition, some of the 1979 ST´s have been relocated and mapped relative to the grid system established in 1980. In 1985 the archeological survey established a concrete benchmark at N100E0.

A trinomial system describes artifact provenience. The system consists of:

Unit Number-Feature Number-Level Number.

Excavation units are numbered sequentially (see Figure 1.5). EU´s 1-164 are the units dug in 1980. The block excavated in 1983 is divided into two sets of excavation units, one for each stratum. EU´s 194-199 are large (2.5 m x 2.5 m, EU´s 194-197; 2 m x 2 m, EU´s 198-199) excavation units that kept provenience control through the aeolian sand; EU´s 201-233 are 1 m x 1 m squares excavated through the paleosol. Six of these (EU´s 201, 205, 213, 221, 225, and 227) were subdivided into 50 cm x 50 cm quadrants, numbered 1 through 4. The unit number of these subdivisions consists of the quadrant number tacked onto the EU number; for example, EU 201 has quadrants 2011(NW), 2012(NE), 2013(SW), and 2014(SE). Shovel test numbers (900-993) include all non-sterile ST´s in the basic shovel test grid and all tests in the arrays around the non-sterile ST´s. Features are numbered sequentially beginning with 01 in each unit; the feature code, "90", refers to material recovered on one-eighth or one-sixteenth inch mesh screens that passes a one-quarter inch screen (used only in 1980). Level numbers are a three digit code, generally based on the beginning depth in centimeters of the level. Except for EU´s 201-233, depths were measured below surface (abbreviated BS) at the northeast corner or the highest corner of each square (this is the "unit datum corner"). The levels in EU´s 201-233 refer to depths measured beneath the top of the paleosol at the unit datum corner. Measurements below the interface are abbreviated as BI.



19BN281 Excavation Unit Designations
in Aeolian Sand (left) and Paleosol (right)

FIGURE 1.5

Excavation Techniques

Shovel tests (1979). The standard shovel test of the park archeological survey was 40 cm in diameter and cylindrical. In practice the surface diameter varied around this standard and the tests commonly tapered inward somewhat. Excavators dug with shovels and did not divide the shovel tests into levels. They screened all soil through 0.25 in (6.4 mm) sieves. Any cultural material retained on the screen was saved; at 19BN281 this material included some stone implements and debitage, fire-cracked rock, and shell. However, the field notes and the author's conversations with Elena Filios indicate that some disagreement arose among crew members about whether all broken chunks of quartz were artifacts. Most shovel tests penetrated the paleosol, but excavators abandoned a few as culturally sterile, apparently before reaching the buried layer.

Excavation Units (1980). All but three of the 1980 season excavation units were 50 cm x 50 cm squares (EU's 140, 146 and 148 were 1 m x 1 m). Excavators dug with both shovels and trowels, but trowels were easier to use in the deeper units. The 1980 excavations employed several combinations of levels and screen sizes as the site examination strategies and procedures were developed. Most units were dug with a combination of arbitrary and natural levels. The excavators took the units down in a single level until they encountered an artifact; then they began using 5 cm or 10 cm levels. Fifty-one excavation units were dug entirely in natural levels, levels being regarded as the major soil horizons in the two strata. Soil was screened through either 0.25 in (6.4 mm) or 0.125 in (3.2 mm) sieves. In many units diggers used the larger mesh size until they started finding artifacts, and then switched to the smaller mesh screens. All cultural materials retained on the screens were saved, and this included all fragments of broken quartz. Excavation units extended at least 20 cm into sterile soil beneath the artifact bearing zone.

Excavation Units (1983). Excavators used large squares (2.0 m or 2.5 m on a side) and 10-15 cm thick levels in the aeolian sand. The boundary between the aeolian sand and the paleosol (the Stratum I/Stratum II interface) was the surface across which an approximately equal mixture of mottles of the two layers occured. Once excavation reached this interface, the crew began using 1 m x 1 m squares (Figure 1.5). From the interface to a depth of about 30 cm, work proceeded in 5 cm aribitrary levels. These levels sloped in the same direction and degree as the interface. The slope of the levels was maintained by measuring the 5 cm increments beneath each corner of the square. The final level was typically an interval of 10 cm, and artifacts were very rare by 40 cm below the interface. Crew members dug mostly by shovel shaving the soil, and they moved the soil from the block to the screens using buckets. All artifacts caught on the screens were saved. A 75 cm x 75 cm stratigraphic pit sampled the sediments underneath the 1983 excavation area. The pit was

located against the south wall of EU 223 and reached a depth of 180 cm (150 cm).

Field Records

Excavators recorded observations on each provenience, including sterile ones, on a standard set of forms. Supervisors' field notes provide additional notes and summarize each day's activities.

The stratigraphy of shovel tests was recorded schematically in a section of each Shovel Test Pit Record. In 1980 the south wall profile of every excavation unit was drawn to scale on Plan/Profile Sheets or graph paper. The field crew photographed profiles of selected units and recorded soil colors of some units using Munsell Soil Color Charts. The units selected for additional recording were spread widely across the site, and a few had profiles with unusual features.

Profile drawings show the entire 28 m perimeter of the 1983 block; other drawings record the profiles along 5 m segments of the N102, N103, E28, and E29 lines and along the south walls of EU's 224 and 225. In both 1980 and 1983, the sequence of steps for making the drawings was as follows: scrape the wall clean, photograph it, outline the horizon boundaries on the wall, and measure and draw the profile. In neither year were walls sprayed to keep them moist, but after a weekend rainstorm toward the end of the 1983 field season, the perimeter walls were covered with plastic sheets to reduce moisture loss until it was time to draw them.

Originals of all field records are stored with the collection. Final storage of these materials will be at Salt Pond Vistor's Center, Cape Cod National Seashore, where they will be under the care of a curator.

CHAPTER 2

Stratigraphy

Introduction

The stratigraphy of 19BN281 as it was understood before the 1983 field season has been described in Borstel (1984a: 181-229). The 1983 fieldwork has caused the author to revise some of his conclusions about the site, especially regarding the extent to which the profile has been disturbed by historic period plowing. In addition, the 1983 analysis provided an opportunity for further study of the earlier stratigraphic observations. This chapter both elaborates on and revises the previous description of stratigraphy at 19BN281, but keeps as its focus the 1983 excavations.

The chapter has three purposes. First, it describes the stratigraphy, soils, and soil anomalies in the 1983 excavation area. This provides an overview of the physical context of the artifacts and a revised description of the stratigraphy at the site. Second, it continues the study of the age and genesis of aeolian sand. As noted in Chapter 1, previous fieldwork was able to establish in a broad sense the agent of transport and the environment of deposition of the sediments overlying the paleosol but was not able to shed light on many details about the origin and deposition of the sand sheet. The data presented in this chapter refine the picture. Third, the chapter examines the genesis and integrity of the cultural deposits in the paleosol. This purpose, too, is an extension of the previous analysis of the site. To accomplish these goals, grain-size analyses of a small group of soil samples was undertaken. In addition, the distributions of lithic and fire-cracked rock densities, measured by both frequency and weight, were analyzed in detail. The chapter reports these analyses in two parts. The bulk of the chapter is descriptive, summarizing each data set separately. Most interpretive comments are reserved for the final section which synthesizes the results of all the analyses.

Readers should note a slight terminological difference between this report and Borstel (1984a). In the previous description of site stratigraphy, the term "stratum" was used in a very broad sense, and it referred to both units of weathering and units of deposition. Here, restricting the term to "depositional units" is useful; in this report units of weathering are referred to exclusively as soil horizons.

Data Sources and Soil Sampling

Field records. The data for this chapter come from several sources. Foremost are field records, which are described in Chapter 1. Relevent data from these records include moist soil color observations recorded using the Munsell system, texture as determined by feel, written descriptions of boundary characteristics and mottling, and profile drawings.

Artifact distributions. A second source of data for this chapter is the vertical distributions of frequencies and weights of several artifact classes. Most of these data were recorded during cataloging, but some additional observations were recorded specifically for this study. This chapter uses the distributions of artifacts as potential markers of the positions of past occupation surfaces and as tracers for the movement of objects in the soil over known periods of time. It views artifacts as attributes of the sediments in the same way that texture, color, chemistry, or lithology are attributes. This use of the distribution data follows studies by Wilmsen (1974), Dincauze (1976), McMillan (1977), Thomas and Robinson (1980), Borstel (1982), and others.

Soil samples. A third source of data is the results of physical analyses of soil samples. Two types of soil samples were collected: wall samples and column samples.

Wall samples are small (ca. 70-100 g) samples collected to represent sections of the soil horizons for both chemical and grain-size studies. Twelve sets were taken from various walls of the excavation area. Typically, a set from one wall included samples of the IA horizon, the upper and lower sections of the IC horizon, the intrusions of the IC horizon into the IIA horizon, the upper, middle, and lower sections of the IIA horizon, and the upper, middle, and lower sections of the IIB horizon (to the depth of excavation). The depths of each sample varied from set to set according to variations in the thicknesses of the horizons.

To collect the samples, the procedure was to scrape the entire wall clean, and then, using a trowel, take soil from a section measuring roughly 5 cm high by 10 cm wide. Within each set, samples were collected from the bottom to the top of the wall, and the trowel was wiped clean between samples. Samples were collected in new plastic bags, and they were frozen at -8

to -12° C shortly after they were collected. The samples were thawed and the bags opened to air dry at 20° to 25° C at the Eastern Archeological Field Laboratory in February 1984.

In August 1984 the author collected ten control samples for comparison with the texture of the IC horizon. Four of these were from about 20 cm below the surface of small dune-like features near the edge of a relict escarpment, 300 m west of the site (identified in tables as HH samples). Six others were from dune surfaces at Head of the Meadow Beach (identified in tables as HoM samples) (Figure 1.1). Collection procedures were the same as those used for the wall samples. The control samples were dried as soon as they arrived at the Eastern Archeological Field Laboratory.

In addition to the wall soil samples, two column samples--from the north wall of EU 203 and from the south wall of EU 223--were collected from the 1983 excavations. These bulk samples were taken to characterize the gravel fraction of the sediments and to identify the types and amounts of cultural material passing the 0.25 in mesh. The columns were in the centers of the north and south walls of the original 5 m block. The columns measured 20 cm x 20 cm and were divided into 5 cm levels. Within the paleosol, column levels correspond to excavation levels. The samples of the south wall of EU 223 are continuous from ground surface to 110 cm BS (80 cm BI), and selected 5 cm intervals continue to 175 cm BS. Sampling began at the surface and moved downwards. Soil was stored in new 12 in x 12 in zip-lock plastic bags. To dry the soil, the bags were left open for over a year at the Eastern Archeological Field Laboratory.

Stratigraphy: Description

Two major strata occur at 19BN281. The upper unit is a layer of wind-transported sand. The lower unit is a podzolic soil developed on glacial drift. These units are numbered in pedological style as Stratum I (upper) and Stratum II (lower). The boundary between the strata, as defined in the field (see Chapter 1), is the I/II interface. Table 2.1 summarizes the characteristics of the soils encountered during the 1983 excavations; the ranges given as the typical thickness for the IA1, IC, and IIA horizons are those of the ranges between the 25th and 75th percentiles. Texture descriptions are based on the grain size analyses described later in this chapter, and the terminology follows Folk (1974:25-30, 46-48). Figure 2.1 shows wall profiles for the N99 and E31 lines. Borstel (1984a:Figure 7.10) presents a map of the overall distribution of stratigraphic units at 19BN281.

Table 2.1

Stratigraphy of 1983 Excavation Area

Horizon	Typical Thickness	Description
IO	ca. 2 cm [2-5 cm]	Organic pad consisting of roots and mineral soil. Because this is a sod layer, the IO horizon is difficult to distinguish from the underlying IA1 horizon.
IA1	6-8 cm (see note a) [4-9 cm] (see note b)	Dark gray to gray (10YR3/1-6/1) poorly sorted fine sand. Little silt or gravel present. Lower boundary is wavy and distinct.
IA2	0 cm [0-4 cm]	Absent.
IC	15-20 (see note c) [12-30 cm] (see note d)	Dark yellowish brown to yellowish brown (10YR4/6-5/4-5/6); 2-5 cm diffuse mottles of brownish yellow (10YR6/6) present throughout horizon. Mottling more pronounced toward bottom of horizon, where both brown (10YR4/3) and brownish yellow mottles occur. Poorly sorted slightly granular fine sand; texture is slightly coarser in plowscars at base of unit. Lower boundary is an unconformity (see below).

UNCONFORMITY: Sharply defined boundary between strata I and II. Boundary is very irregular and is marked by plowscars filled with IC horizon soil. The plowscars are typically assymetrical and roughly trapezoidal in section. A distinct lens of IIA soil sometimes extends partly or completely across the top of the plowscar. Plowscars generally extend 4-8 cm into IIA horizon. In intervals of profile where the boundary is flat (i.e., the boundary is not formed by a plowscar cross-section), small mottles of IIA soil penetrate 1-2 cm into the IC horizon.

Table 2.1 (Continued)

Horizon	Typical Thickness	Description
IIA[p?]	12-15 cm [7-14 cm]	Dark brown to dark yellowish brown (10YR4/3-4/4) with very abundant 2-10 cm mottles of yellowish brown (10YR 4.5/4-5/4), occasional 2-5 cm mottles of yellowish brown IC soil, and occasional mottles of strong brown IIB2 soil. Poorly sorted, pebbly to slightly granular silty fine sand; sorting is poorer than in IC horizon above. Percentage of large clasts of cultural and non-cultural origin increases toward bottom of horizon. Ventifacts rare. Lower boundary distinct, wavy.
IIA2	0 cm [0-8 cm]	Absent.
IIB2	61 cm (see note e) [>40 cm]	Strong brown (10YR5/6), grading to reddish yellow (7.5YR6/8) midway through horizon, grading to yellowish brown (10YR5/6) at bottom of horizon. Poorly sorted pebbly to slightly granular silty fine sand, grading to poorly sorted pebbly medium sand, grading to moderately sorted fine sand with little gravel. The zone with the highest proportion of pebbles is also the zone with the greatest abundance of ventifacts; in EU 223 ventifacts reach peak abundances ca. 49-62 cm BI (83-96 cm BS). Lower boundary is straight and gradational.

Table 2.1 (Continued)

Horizon	Typical Thickness	Description
IIB3	56 cm (see note e)	Brownish yellow (10YR6/6) at top grading to yellow (10YR7.5/6) at bottom. Occasional 10-20 cm diffuse mottles of brownish yellow in lower half. Moderately sorted fine sand, grading to moderately sorted medium sand. Gravel rare throughout. Lower boundary is straight and gradational.
IIC		Yellow (2.5Y8/6) moderately to poorly sorted medium to coarse sand.

Notes:

Numbers in brackets are for overall site (from Borstel [1984a:Tables 7.1 and 7.4], except as noted below). Ranges for 1983 excavations for IA, IC, and IIA horizons between the 25th and 75th percentiles of measurements, with interval of measurement as noted below.

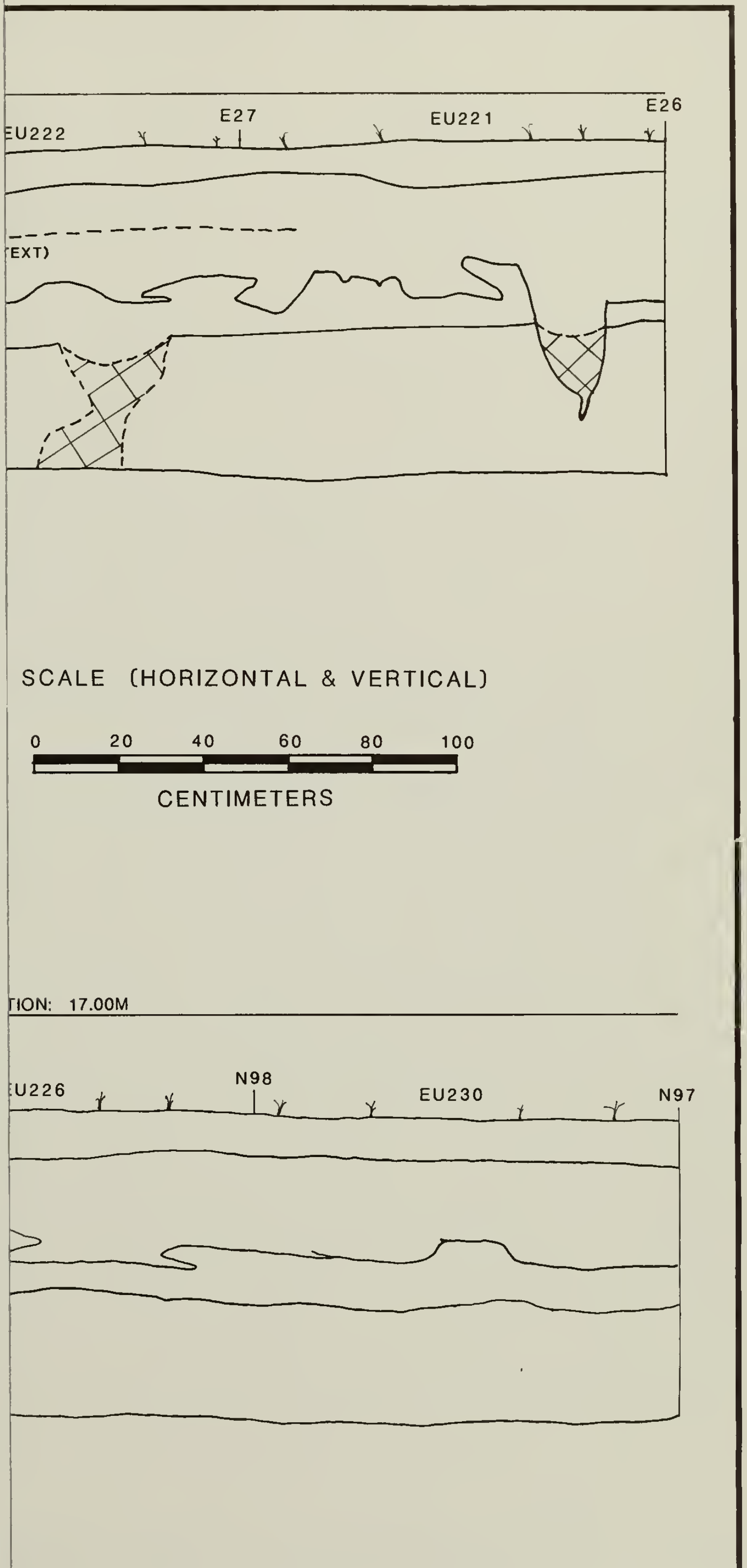
a:Measured on the perimeter of the excavation area at 1 m intervals (n=27).

b:Revised from Borstel (1984a:Table 7.4), based on a new review of the 1980 profiles.

c:Range is 25th-75th percentiles for entire thickness of stratum I less 9 cm (average thickness of IO+IA horizons along perimeter of excavation).

d:Revised from Borstel (1984a:Table 7.4). The figures in that table incorrectly refer to the entire thickness of stratum I. The range shown here is the 25th-75th percentiles for that thickness less the estimated thickness of the IO+IA horizons.

e:Thickness of horizon on S wall EU 223.


EU222
E27
EU221
E26
EXT)
SCALE (HORIZONTAL & VERTICAL)
0
20
40
60
80
100
CENTIMETERS
TION: 17.00M
EU226
N98
EU230
N97

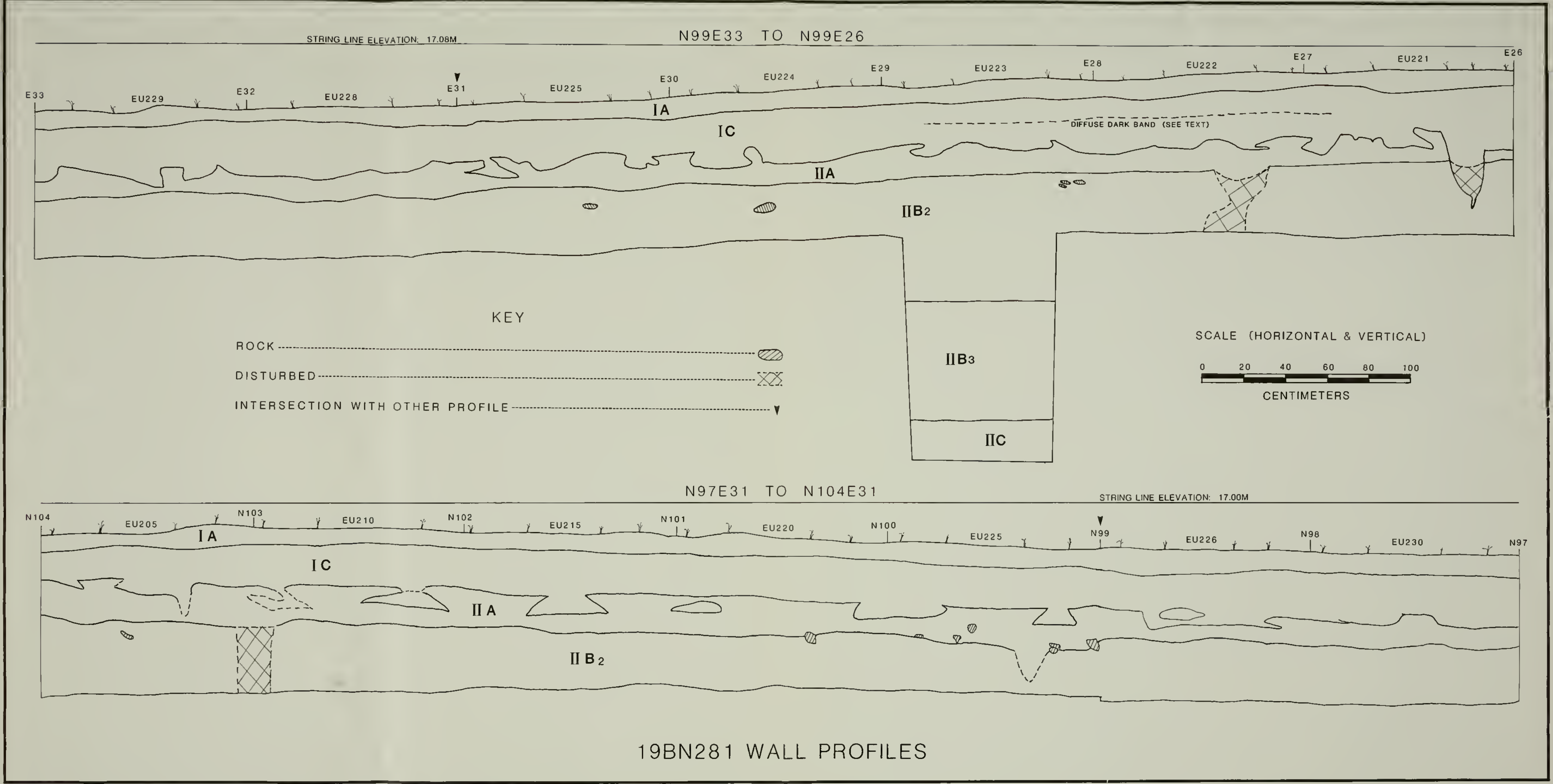

N99E33 TO N99E26
STRING LINE ELEVATION: 17.08M
E33
EU229
E32
EU228
E31
EU225
E30
EU224
E29
EU223
E28
EU222
E27
EU221
E26
IA
IC
DIFFUSE DARK BAND (SEE TEXT)
IIA
IIB2
IIB3
IIC
KEY
ROCK
DISTURBED
INTERSECTION WITH OTHER PROFILE
SCALE (HORIZONTAL & VERTICAL)
0
20
40
60
80
100
CENTIMETERS
N97E31 TO N104E31
STRING LINE ELEVATION: 17.00M
N104
EU205
N103
EU210
N102
EU215
N101
EU220
N100
EU225
N99
EU226
N98
EU230
N97
IA
IC
IIA
IIB2
19BN281 WALL PROFILES

FIGURE 2.1

Stratum I (Aeolian Sand)

Soil horizons in Stratum I (Table 2.1) are poorly developed. The profile consists of a thin sod layer and A1 horizon underlain by a mottled horizon, here designated IC. This designation is used because soil horizons are beginning to develop in Stratum I, and because the effects and extent of plowing within the horizon (described below) are hard to evaluate. In the 1983 excavation area, Stratum I ranges from 17 cm to 35 cm thick; this range is based on the difference between measurements of the elevation of ground surface and that of the I/II interface measured on 50 cm centers (n=161). Stratum I has a mean thickness of 27 cm.

The characteristics of Stratum I in this part of the site are typical for the site as a whole (Borstel 1984a:Table 7.4). Color, mottling, and texture of the horizons are within the previously observed range. Absent is a IA2 horizon which is rare overall at the site. No lamellae or bedding occurs in the IC horizon, but such structures were noted only occasionally in the 1980 work. The median thickness of the stratum in the 1983 excavations, 28 cm, is nearly identical to the median for the 1980 EU's, 29 cm. The range of thicknesses is smaller because of the sheet-like character of the aeolian sand layer in this part of the site.

Strata I/II Boundary

The boundary between Strata I and II (Table 2.1) is an unconformity that separates the blanket of recent aeolian sand from the underlying paleosol (Figures 2.2-2.3). The boundary is irregular, and because of this irregularity, the interface between the strata was somewhat arbitrarily defined during the 1983 excavations. The interface is defined as the surface across which an approximately equal mixture of mottles of soil from each stratum occurs. This interface marks the approximate elevation of the original ground surface immediately before burial.

In the part of the site excavated in 1983, the interface is marked by subparallel bands of light and dark mottles (Figure 2.2). The light bands are predominantly mottles of yellowish brown IC soil, while the dark bands are predominantly dark brown IIA soil. In plan view the boundaries between the bands are sharply defined and very wavy. The bands occur on roughly 30-35 cm centers; at the I/II interface as exposed in the 1983 excavations, the dark bands tended to be slightly wider (ca. 15-20 cm wide on average) than the light bands (ca. 10-15 cm wide). The bands are not equally distinct everywhere. They are most prominent in the southern and eastern portions of the 5 m x 5 m excavation area and in the southeastern extension; the center of the 5 m x 5 m block was marked by only amorphous mottling.

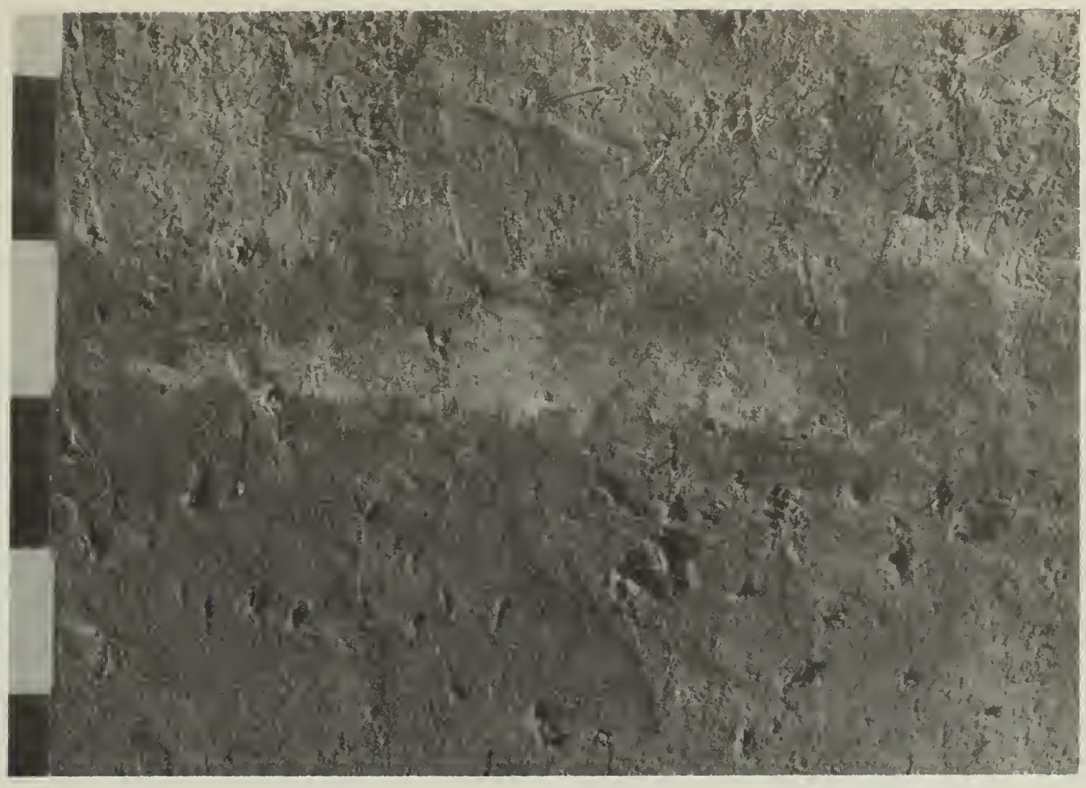


FIGURE 2.2. Interface of Strata I and II in Excavation Unit 221, showing plowscars containing IC soil. North is to the let. Scale is 1 m long.

FIGURE 2.3. Plowscar containing IC soil extending into the IIA horizon. View shows the east wall of Excavation Unit 210. Scale is gradduated in 10 cm increments.

The I/II interface and the present ground surface lie in roughly parallel planes. Both surfaces dip southeasterly and have gradients of about 3.5% (2°) (Figure 2.4). The bands of mottling strike N32 -42 W --approximately the same direction as the dip of the I/II interface.

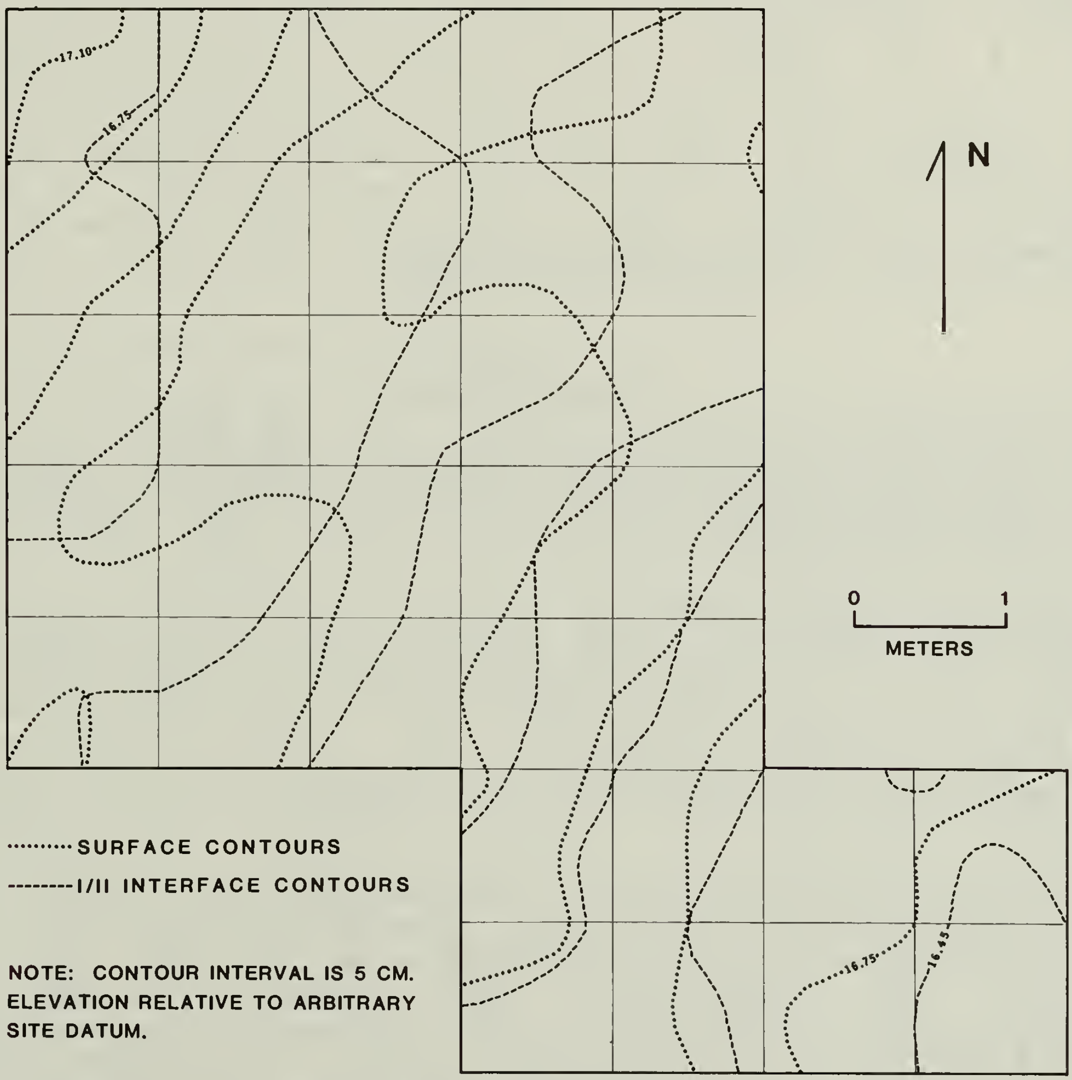
In section, the boundary between the strata undulates, as would be expected from the occurrence of banding. In wall profiles the boundary is marked by a number of "intrusions" of IC soil extending 4-8 cm into the IIA horizon (Figures 2.1 and 2.3). These intrusions are trianguloid or trapezoidal in section. The intrusions often expand downward, and they typically have long, flat, or slightly sloping, bottoms. Occasionally a thin lens of IIA soil extends completely over the IC intrusion. Based on grain size analyses of a limited set of samples, the IC soil in the intrusions is slightly coarser than the overlying IC horizon.

The 1980 excavations showed the strata I/II boundary to be irregular. A few of the 50 cm squares produced IIA horizons that were partially truncated by trianguloid soil anomalies. These had been tentatively identified as small rills cut into the devegetated ground surface before it was buried. The discovery of such prominent banding in 1983 was completely unexpected. The strike of the banding in the direction of maximum slope seemed to support the hypothesis of rill erosion, although the regular spacing of the bands was surprising. As profiles of the paleosol became exposed, it became apparent that this hypothesis had to be rejected.

The banding is now interpreted to be plow scarring. Several characteristics support this hypothesis. The bands have fairly regular, subparallel spacing. The profiles of the bands resemble cross-sections of plow shares, and interpreting the bands as plowscars accounts for the places in which the IIA horizon partially or completely overlies the IC horizon. Finally, the floors of the intrusions do not contain accumulations of gravel, as might occur in bottoms of erosional channels. The depth of disturbance of the IIA horizon and its horizontal extent are taken up in later sections of this chapter.

Stratum II (Paleosol)

The paleosol (Table 2.1) is a well-developed podzolic soil. The upper horizons of this stratum have less well sorted textures and a higher percentage of silt than Stratum I. The IIA horizon has been truncated by plowing, and Late Archaic occupation probably also altered its development. Since plowing may not have disturbed the entire IIA horizon (see below), this designation is used, rather than IIAp. The IIA horizon is strongly mottled throughout, in part as a result of plant roots and disturbances by soil organisms. The IIA horizon ranges from 9 cm to 19 cm in thickness; this range is based on measurements



19BN281 Topography at Surface and I/II Interface

FIGURE 2.4

taken at 1 m intervals of the actual horizon thickness, including localized truncations caused by plowscars or an interpolated thickness where profile drawings were lacking (n=48). It is underlain by the IIB2 through IIC horizons. The IIB2/IIB3 and IIB3/IIC boundaries are gradational. A zone in which late Pleistocene ventifacts are abundant occurs at a depth of 49-62 cm BI in EU 223 (Table 2.1).

The characteristics of Stratum II in this part of the site are, like those of Stratum I, typical for the site as a whole (Borstel 1984a:Table 7.1). Color, mottling, and texture of the horizons are within the previously observed range. A IIA2 (podzol) horizon is absent in the 1983 excavation area, and the IIB2 horizon could not be separated into IIB21 and IIB22. Each of these horizons occurs in about one-quarter of the units excavated in 1980 (generally the IIA2 co-occurs with the IIB21/IIB22 horizons), primarily near the floor of the swale. The zone of ventifacts, which is centered 50-60 cm below the I/II interface was, noted in the 1980 field season, but its presence and depth were not consistently recorded.

Soil Anomalies

The 1983 excavations produced no prehistoric cultural features. The excavations did encounter several soil anomalies, other than the plowscars and mottling already described, and one historic period feature.

A thin anomaly occurred in the IC horizon in the N99 wall between about E26.8 and E28.8 (Figure 2.1). The anomaly was noticed only during wall cleaning, not excavation; hence, its horizontal extent is unknown. The anomaly was a diffuse grayish band having a maximum thickness of 3 cm. It may have been either a lens of redeposited IIA soil or an organic layer developed in place during an interregnum in the deposition of the aeolian sand.

The historic period feature was not assigned a number in the field nor was it excavated as a distinct entity. It was a rectanguloid anomaly at the intersection of EU's 213, 214, 218, and 219. The disturbance was recognized less than 5 cm below the I/II interface, and it extended to about 38 cm BI. In the lowest 10 cm it tapered to a point. The anomaly was ca. 13 cm (SW-NE) by 16 cm (SE-NW) and was filled with IC soil. The rectanguloid plan and its profile both suggest the feature is a historic period posthole.

The majority of anomalies are the result of the activities of burrowing mammals. The area excavated in 1983 had no burrows presently in use, although some burrowing mammals live within the site boundaries today. Eleven excavation units, including EU's 204, 211-215, 219, 220, 222, 225, and 229, had such disturbances. The anomalies could be recognized only in the IIB2 horizon. They

were patches of dark brown or grayish brown mottling that contrasted with the color of the surrounding soil. Generally, this mottling had a consistent appearance in both plan and section exposures; however, the anomalies in EU 204 had alternating lenses of dark gray and light yellow soil, perhaps representing successive events in the maintenance or infilling of the burrow. In several cases the disturbance began at the bottom of the IIA horizon and tapered sharply downwards; these filled-in tunnels also sometimes branched or changed direction horizontally or vertically. The burrow fill included charcoal in EU's 214, 215, and 219; this may indicate that these burrows were filled about the time European colonists cleared the forest from the site.

Sediment Analysis

Subsampling and Analytic Methods

Fine fraction. Larry Poppe of the U.S. Geological Survey, Office of Marine Geology, Wood's Hole, Massachusetts, analyzed 38 site and off site control samples in September, 1984. Thirty-two samples come from four site profiles: EU 203, north wall; EU 211, west wall; EU 223, south wall; and EU 233, south wall. The samples thus span the 1983 excavation area north to south and east to west. Three of the control samples are from the scarp area west of the site, and two control samples are from foredunes that cap the marine escarpment just south of the Truro town parking lot at Head of the Meadow Beach.

In all cases the samples submitted to Poppe were subsamples. Since a sample splitter was unavailable, the author took subsamples by thoroughly stirring the sample and spooning out sediment, until an appropriate weight was reached. Those from EU's 211 and 233, along with one each from EU's 203 and 233 and the controls, are subsamples of wall samples. The majority from EU's 203 and 223 are subsamples of column samples. In some instances, the column samples had already been sieved to determine the percentage of clasts greater than 2.0 mm; the composition of the original sample was reconstructed by adding to the subsample the appropriate percentage of the separated gravel. The samples submitted ranged in weight from 47.0 g to 86.4 g (wall samples from the excavation units) and from 257.1 g to 436.0 g (column samples from EU's 203 and 223 and control samples).

Poppe's analytical procedures are described in detail in Poppe et al. (1985). Briefly, samples are examined to determine whether sufficient gravel is present to require a large (several hundred gram) sample; if not, the sample is split to a smaller

subsample; all but four of the 19BN281 subsamples were so further split. If abundant organic matter is present, the sample is treated with hydrogen peroxide. Samples are run through an automated sieving system, and a computer performs the necessary calculations for fraction percentages and sample statistics and generates histograms and cumulative percentage graphs. Sample statistics and graphics employ phi units, the standard scale for describing sand size and smaller particle distributions in geology (Folk 1974: 25-26). Phi is defined as the negative of the logarithm to base 2 of the particle diameter (Krumbein 1934).

Coarse fraction. The author analyzed 17 samples from the EU 203 and EU 223 columns. Unfortunately lack of time prevented analysis of other levels in these columns. Analysis concentrated on levels from the paleosol having high artifact densities, with representatives of higher and lower levels. Sample sizes ranged from 2703.3 g to 4017.0 g.

Analysis begins by passing the sample through a 2 mm sieve, shaking and tapping the screen by hand. Rootlets caught on the sieve are removed, weighed, and discarded. The analyst sorts through the fraction retained on the sieve to remove all cultural materials. Lithics and fire-cracked rock are separated into size fractions using sieves constructed of 0.25 in (6.4 mm) and 0.125 in (3.2 mm) hardware cloth. The noncultural gravel is sorted into two fractions by comparison to a card marked with an 8 mm grids. The ≥8 mm fraction is sorted into two groups: ventifacts and pebbles lacking evidence of wind polish. The analyst weighs all fractions, counts most fractions, and stores them in labeled containers. Percentages of gravel are calculated after deducting the weights of cultural material and rootlets ≥2 mm from the total weights.

Results

Texture. Appendix 1 provides a detailed summary of the results of the fine-fraction analyses (Tables A1.1-A1.4). Note that the percentages of sand, silt, and clay (Table A1.2) from the column subsamples of EU's 203 and 223 have been adjusted against the percentage of gravel as determined by the coarse analysis. This modification reflects the greater accuracy of gravel percentages produced by coarse analysis which used large samples.

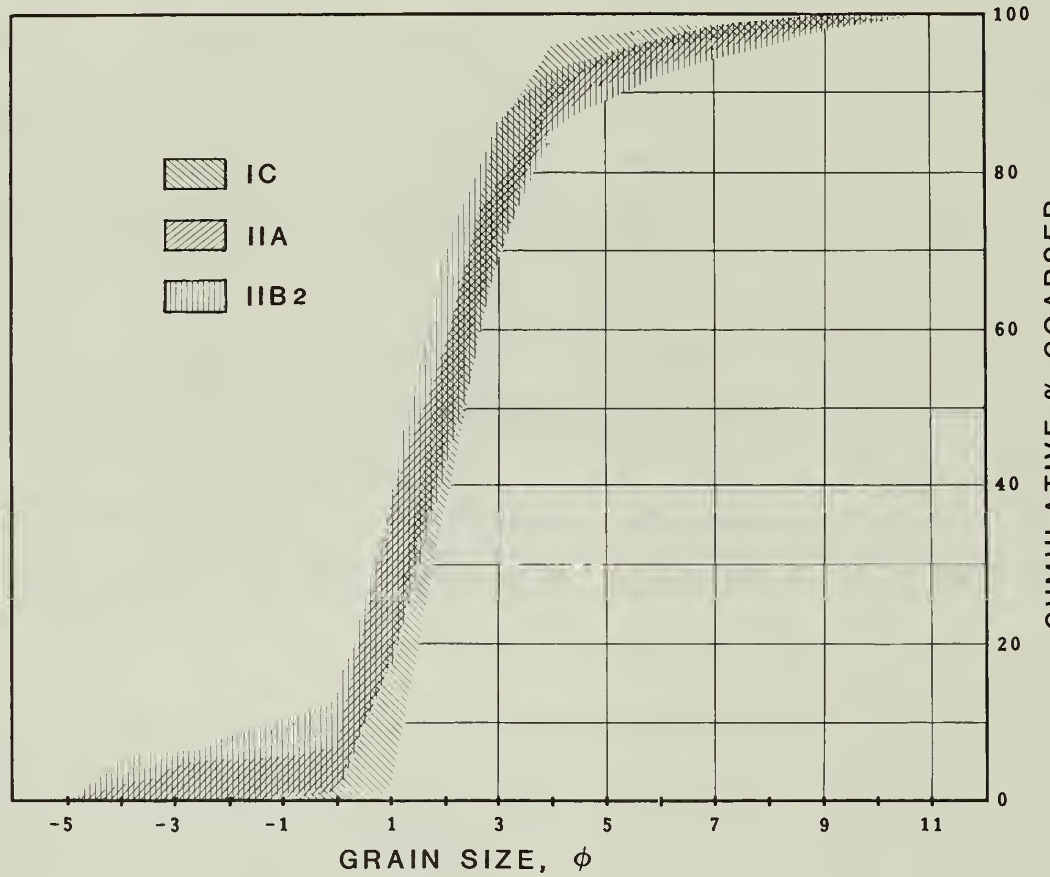
By several measures, the textures of Strata I and II differ little. The ranges for the mean (Table 2.2) and median (Tables A1.3 and A1.4) grain size of texture from the IC, IIA, and IIB2 horizons are similar. Grain size envelopes for the three horizons overlap considerably, being differentiated mainly in the tails of the distributions (Figure 2.5).

On the other hand, the strata show small, but significant, differences in the degree of sorting (Table 2.2) and in the

TABLE 2.2

Grain Size Analyses: Ranges for Selected Statistics
(In *Phi* Units)

Horizon	n	Inclusive Graphic Statistics x	Inclusive Graphic Statistics s	Method of Moments Statistics x	Method of Moments Statistics s
Site					
IC	7	1.88-2.51	0.98-1.35	1.98-2.61	1.26-1.60
IC-plowscar	4	1.83-2.27	0.95-1.20	1.92-2.38	1.15-1.41
IIA	10	1.83-2.19	1.40-2.19	1.84-2.39	1.66-2.14
IIB2	10	1.44-2.33	1.42-2.39	1.35-2.39	1.65-2.51
IIB3	1	1.20	1.01	1.22	1.17
IIC	1	1.41	1.52	1.83	2.02
Controls					
IC-HH	3	1.63-1.96	1.06-1.14	1.73-2.07	1.41-1.44
IC-HoM	2	0.73-0.80	0.52-0.55	0.77-0.81	0.59-0.61



19BN281, EU'S 194-233
GRAIN SIZE ENVELOPES

FIGURE 2.5

proportions of the major texture classes (Table 2.3). Although virtually all samples from the site are poorly sorted (as defined by Folk 1974:46), those from Stratum I are better sorted in numerical terms than those of Stratum II. Only the single sample from EU 223's IIB3 horizon falls within the range of standard deviations for Stratum I. The ranges for percentages of gravel, sand, and fines (silt and clay) also display little overlap. They are significantly different as indicated by analysis of variance (Tables 2.4-2.5). The omega-square statistics (Table 2.5) (Hays 1973:484-488) for these analyses denote a strong association between horizon and percentage of texture class. Post hoc comparisons differentiate Stratum I from Stratum II on the basis of percentage of gravel and stratum IC from stratum IC-plowscar from Stratum II on the basis of percentage of sand and percentage of fines. A conventional triangle diagram on which points are plotted using percentages of gravel, sand, and fines does not differentiate the horizons very well (Figure 2.6). The best separation appears by plotting the proportions of coarse (0-1 phi), medium (1-2 phi), and fine (2-3 phi) sand (Figure 2.7).

In brief, although the two strata overlap considerably in texture, Stratum I tends to be somewhat better sorted and somewhat sandier than Stratum II. Stratum II has somewhat more to considerably more gravel and somewhat more silt and clay than Stratum I. Within Stratum I, the sediments in the plowscars are slightly coarser and slightly better sorted than the overlaying material; these characteristics may in part account for the tendency of the plowscars to dry more rapidly than the surrounding soil. In Stratum II the percentage of gravel tends to increase from the interface to the ventifact zone; it then declines. Consistent changes in the sand and fines fractions are hard to recognize. Figure 2.8 illustrates the trends in the major texture classes for the two column samples.

On the basis of stratigraphic position and surface topography, the control samples from High Head are probably part of the same sedimentary unit as those from the site's Stratum I. The controls are about as well sorted as the IC horizon material from the site, but they average a little coarser and have a slightly higher percentage of sand and a lower percentage of silt (Tables 2.2-2.3). Additional control samples are required to verify these observations. The two controls from the foredunes at Head of the Meadow Beach differ markedly from all the other samples (Tables 2.2-2.3). They are coarser, sandier, and much better sorted. These differences reflect sorting of eroded glacial drift by wind and waves. The implications of the grain-size analyses for the depositional history of the archeological sediments is further considered in the discussion section at the end of the chapter.

TABLE 2.3

Grain Size Analyses: Percentages of Texture Classes
(In Phi Units)

Horizon	n	% Gravel	% Sand	% Silt	% Clay
Site					
IC	7	0.0-0.28	88.99-96.05	2.83-10.12	0.8-2.05
IC-plowscar	4	0.17-0.59	91.95-96.79	2.53-6.47	0.51-1.02
IIA	10	1.00-5.70	80.47-88.84	7.32-12.62	1.0-2.66
IIB2	10	0.83-7.7	79.05-86.2	5.4-12.87	1.20-4.1
IIB3	1	2.00	97.00	0.7	0.3
IIC	1	1.00	89.00	6.2	3.8
Control					
IC-HH	3	0.10-0.27	96.58-97.33	1.37-1.90	1.09-1.42
IC-HoM	2	0.0	99.83-99.94	0.05-0.12	0.02-0.05

TABLE 2.4

Summary Statistics for Analysis of Variance
(Percentages of Size Fractions)

Horizon	Sum	Mean	Stan. Dev.	n
Gravel				
IC-site	.74	.10	.10	7
IC-plowscar	1.17	.29	.20	4
IIA	26.73	2.67	2.06	10
IIB2	40.65	4.06	3.24	10
Overall	69.29	2.24	2.68	31
Sand				
IC-site	641.98	91.71	2.20	7
IC-plowscar	379.47	94.87	2.15	4
IIA	857.64	85.76	3.33	10
IIB2	837.22	83.72	2.55	10
Overall	2716.31	87.62	4.88	31
Fines				
IC-site	57.29	8.18	2.30	7
IC-plowscar	19.34	4.84	1.97	4
IIA	115.63	11.56	1.79	10
IIB2	122.13	12.21	2.20	10
Overall	314.39	10.14	3.26	31

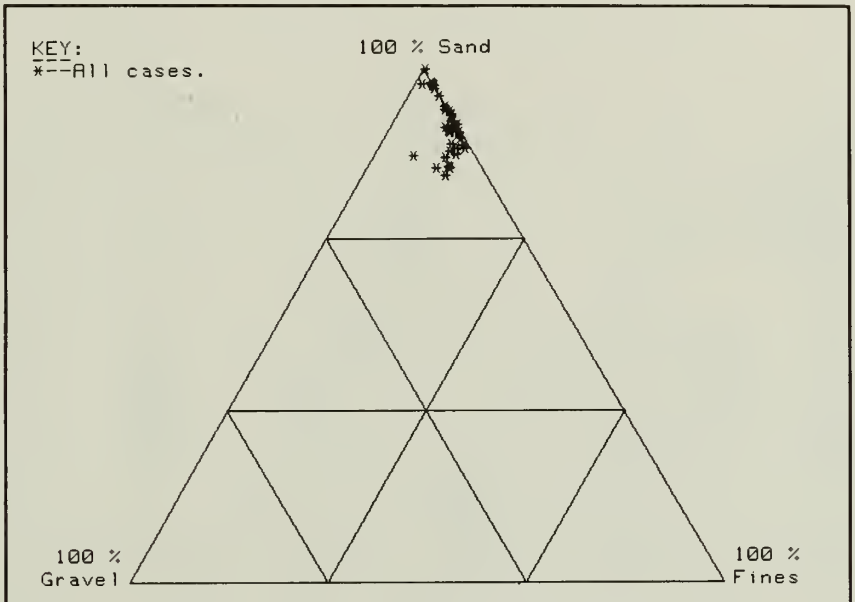
Note: Fines are silt and clay.

TABLE 2.5

One-way Analysis of Variance For Percentage of Size Fractions

Source	Df	Sum of Sqs.	Mean Sq.	F-Ratio	F-Prob.
Gravel ANOVA					
Total	30	215.1392			
Between means	3	82.2377	27.4126	5.5691	.00416
Within groups	27	132.9015	4.9223		
w^2=0.31					
Sand ANOVA					
Total	30	714.8050			
Between means	3	513.6747	171.2249	22.9855	.00000
Within groups	27	201.1304	7.4493		
w^2=0.68					
Fines ANOVA					
Total	30	318.4202			
Between means	3	202.5683	67.5228	15.7366	.00000
Within groups	27	115.8519	4.2908		
w^2=0.59					

Note: Fines are silt and clay.



Textures of Archeological Sediments & Control Samples

FIGURE 2.6

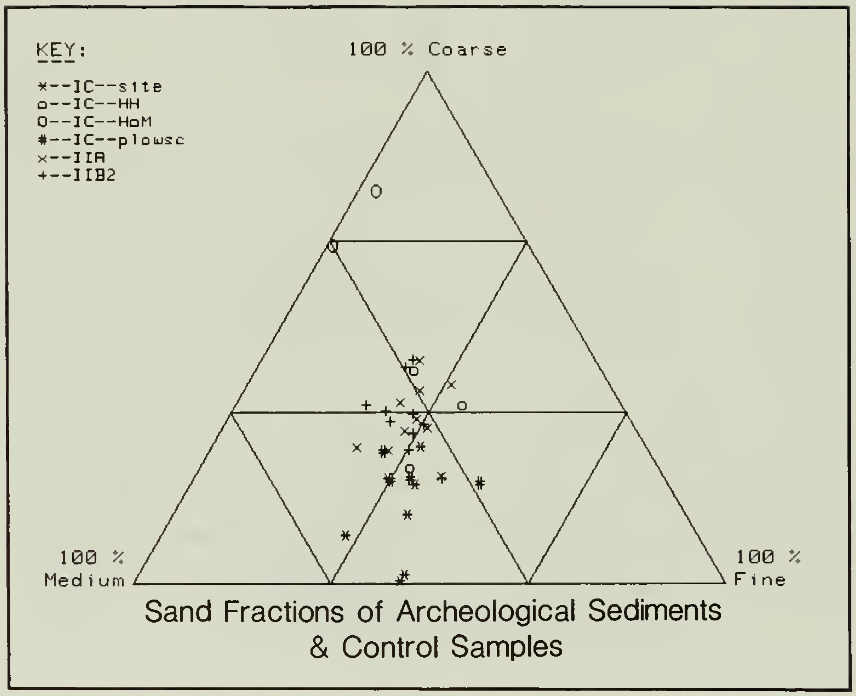
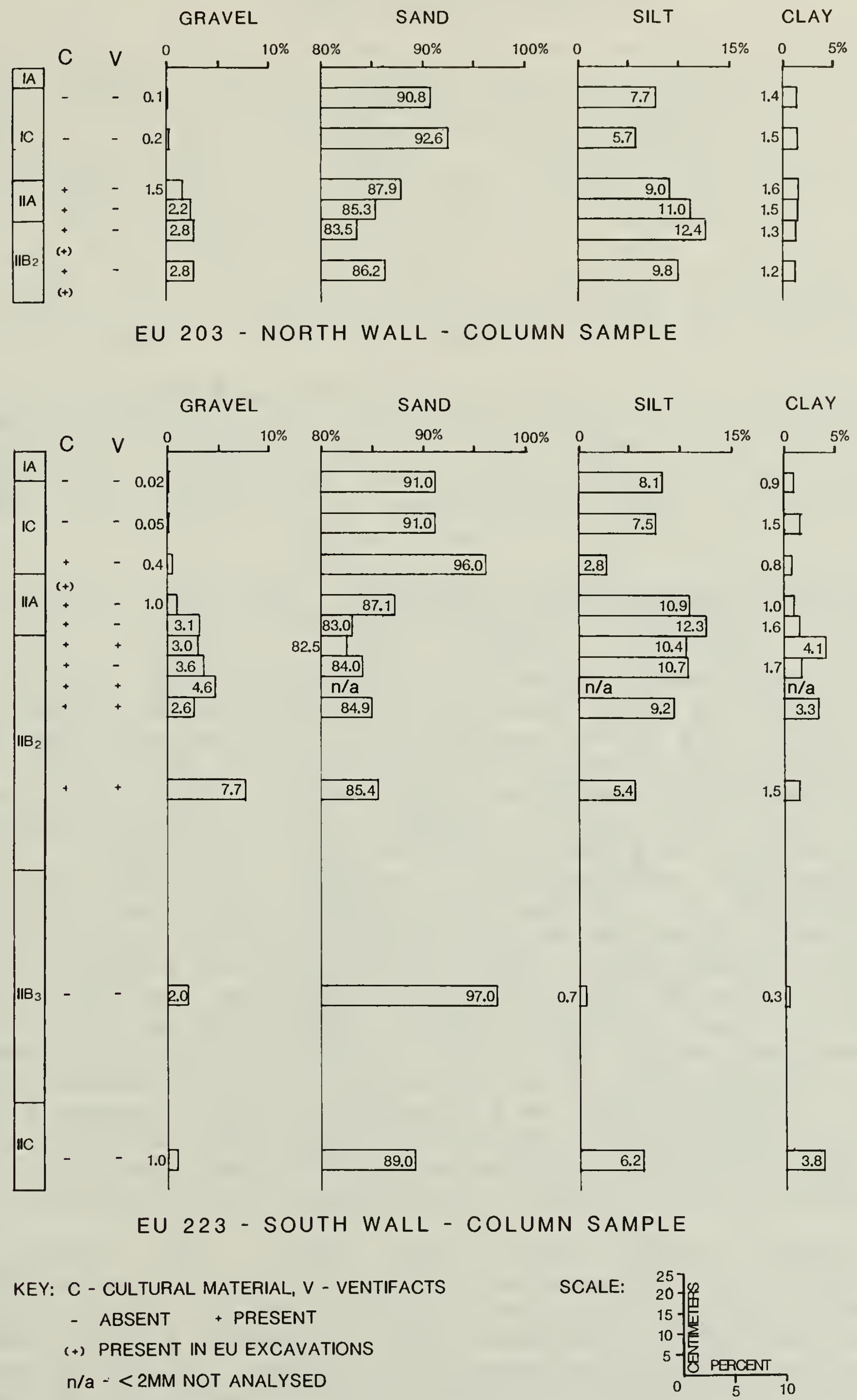

KEY:
*--IC--site
o--IC--HH
O--IC--HoM
#--IC--plowsc
x--IIA
+--IIB2
100 % Coarse
100 % Medium
100 % Fine
Sand Fractions of Archeological Sediments
& Control Samples

FIGURE 2.7



Percentages of Texture Classes from Column Samples

FIGURE 2.8

Artifacts from Columns

The column samples produced several types of artifacts, comprising carbonized material, calcined bone, lithics (mostly trim flakes and shatter), and fire-cracked rock (Tables 2.6-2.7, A1.5-A1.6; Figure 2.8). Carbonized material covers a range of small carbonaceous objects, including wood charcoal and amorphous, vacuolar fragments. Not all carbonized material is necessarily the product of prehistoric human activities. Forest fires of natural origin can also contribute, and burrowing animals can bring recently burned material into the soil. Carbonized material occurs widely in Stratum II, and based on limited sampling, it is not common in Stratum I (Table 2.6).

The excavation units recovered small quantities of calcined bone (see Chapter 3), but bone seems to be underrepresented in the column samples (Table 2.6). Fewer levels in the columns produced bone as compared to the same levels in the adjacent excavation units. This difference is a product of the low frequency of calcined bone in the paleosol.

The column samples allow recovery rates for lithics and fire-cracked rock to be evaluated (Table 2.7; raw data in Tables A1.5-A1.6). Recovery rates vary widely, probably reflecting small sample sizes, but rates calculated on the basis of item counts tend to be lower than those based on weights. On average a 0.25 in sieve recovers about 23% by count and around 85% by weight of all lithics caught by a 2 mm sieve. These results are generally consistent with Kalin's (1981) experimental work. As with the column samples, Kalin reports much higher recoveries on 0.25 in sieve as calculated by weight than by count. Percentage recoveries by weight are roughly equivalent (Kalin 1981:Table 3). On the other hand, the percentages of lithics by count from the column samples are substantially higher than Kalin's experimental data (1981:Table 2), probably because his methods recovered large numbers of debitage smaller than 1/16 in (1.6 mm). A 0.25 in sieve recovers about 40% by count of all fire-cracked rock caught on a 2 mm sieve and about 85% by weight. The higher recovery rate based on counts for fire-cracked rock in comparison to lithics may be misleading. Small fragments of FCR are much more difficult to identify confidently because of the lack of distinguishing attributes. In comparison, identifying small chips produced by stone tool making is not difficult.

The column sample data imply that the lithic and fire-cracked rock frequencies in this and the following chapter are substantially less than the actual totals. This inference makes the reasonable assumption that the column sample rates are representative of rates for excavation sieves. For some types of analysis, such as those that relate flake frequencies to number of units of work, low recovery rates might pose a problem. Since the recovery rates show some degree of uniformity and since count and weight percentages appear to correlate, under-representation poses no serious difficulties for this study.

TABLE 2.6

Occurrence of Carbonized Material and Bone in Column Samples

Interval (cm BS)	Horizon	Carbonized Material	Bone
EU 203			
5-10	IC	-	-
15-20	IC	-	-
27.5-32.5	IIA	+	+
32.5-37.5	IIA	+	+
37.5-42.5	IIB2	+	-
47.5-52.5	IIB2	+	-
EU 223			
5-10	IA/C	-	-
15-20	IC	-	-
25-30	IC	+	-
35-40	IIA	+	-
40-45	IIA/IIB2	+	+
45-50	IIB2	+	-
50-55	IIB2	+	-
60-65	IIB2	+	-
65-70	IIB2	+	+
80-85	IIB2	+	-
130-135	IIB3	-	-
170-175	IIC	-	-

TABLE 2.7

Recovery Rates of Lithics and FCR on 0.25 in Mesh
(EU 203 and 223 Column Samples)

Interval (cm BS)	Horizon	Lithics n	Lithics wt	FCR n	FCR wt
EU 203					
5-10	IC	-		-	
15-20	IC	-		-	
27.5-32.5	IIA	17%	86%	46%	92%
32.5-37.5	IIA	29%	85%	25%	59%
37.5-42.5	IIB2	24%	96%	61%	99%
47.5-52.5	IIB2	13%	49%	0%	0%
EU 233					
5-10	IA/C	-	-	-	-
15-20	IC	-	-	-	-
25-30	IC	43%	96%	100%	100%
35-40	IIA	24%	86%	-	-
40-45	IIA/IIB2	24%	78%	22%	87%
45-50	IIB2	18%	97%	50%	98%
50-55	IIB2	14%	68%	63%	99%
60-65	IIB2	13%	82%	0%	0%
65-70	IIB2	60%	91%	-	-
80-85	IIB2	0%	0%	-	-
130-135	IIB3	-	-	-	-
170-175	IIC	-	-	-	-

Notes: Percentages removed = (100) (amount retained on 0.25 sieve)/(total on 2 mm sieve). Raw data is tabulated in Tables A1.5-A1.6.

Soil pH

Soil pH was measured on 40 wall samples from four excavation units in August 1985. These measurements were taken after the air dried samples had been in storage for 21 months. A Photovolt brand meter was used following Peech's (1965) methods for pH measured in water. The distilled water used for making up the slurries had a pH of 4.5-5.0. Results are given in Table A1.7 of Appendix 1.

Soil at the site is acidic. Values for pH range from 3.6 to 4.4 in the aeolian sand, averaging 4.0. Soil pH tends to increase from the surface to the bottom of the horizon, and the highest readings occur in the plowscars. In the IIA horizon pH values range from 3.7 to 4.5 and average 4.0. No clear relationship between pH and depth can be perceived in this horizon. Readings in the IIB2 horizon range from 3.6 to 4.2, averaging 3.9.

Artifact Distributions in Profile

Objectives

The distribution of artifacts through the soil profile is a product of many factors, including rates of cultural deposition, rates of sedimentation, sediment type, age of occupations, and soil disturbance processes. In environments where episodes of sedimentation are roughly contemporary with periods of human habitation, occupation horizons may be marked by zones of high artifact densities, separated by zones of low artifact density. These zones of high artifact density may represent former land surfaces that were intensively occupied and subsequently buried. Floodplains, rockshelters, and shell middens are all settings in which multiple peaks of artifact densities may serve as stratigraphic markers for successive occupations.

Lack of sediment deposition to the uplands of Cape Cod during the prehistoric period (McManamon and Borstel 1984:98) means that the paleosol at 19BN281 is unlikely to show evidence of more than one cultural stratum (chronostratum), no matter how often or over how long a period people used the site. Analysis of the 1980 excavations confirms that, as expected, lithics are unimodally distributed through the soil column (Borstel 1984b:199-203). This section examines the distributions of artifacts in the soil column from the 1983 excavations. It builds on the previous study of the stratigraphy of 19BN281 by using additional categories of artifacts and by examining more than one measure of artifact density. The discussion section that follows this one considers the implications of these data

for artifact context and the formation of the archeological deposits.

Although study of the 1980 data confirmed the unimodal character of the lithic distribution, it did not look closely at the tails of the distributions for evidence of stratification there. Thomas and Robinson (1980:30) hypothesize that older and younger assemblages may be separated in the lower portion of the profile because the density of younger artifacts should decrease more rapidly than that of older artifacts. Thus, examining the deeper portion of the distribution may help indicate whether the small assemblage of felsic volcanic artifacts is contemporaneous with quartz assemblage. If the densities and proportions of these two rock types are constant through the soil column, then a hypothesis of contemporaneity would be supported.

Study of the vertical distributions of artifacts also assists in the evaluation of the effects of plowing on the site. If plowing penetrated and mixed the entire IIA horizon, then artifact density distributions should reflect this disturbance. Profiles from sites at Nauset generally show a peak artifact density in the central one-third of the plowzone (Borstel 1984a:204-210); a similar peak should occur in the IIA horizon if that horizon is a plowzone.

Study of the vertical distribution of artifact size may also yield useful insights into the transformational processes affecting artifact locations. This study uses average artifact weight to describe artifact size. The previous study of artifact distributions at 19BN281 hypothesized that the "weight of the artifacts caused them to settle through the soil, as a particle does in a liquid or gas" (Borstel 1984a:202-203). If this notion is correct, then artifact weight should tend to increase with depth.

Methods and Sampling

The abundance of artifacts per unit volume, or density of artifacts, can be measured in at least two ways: by frequency and by weight. These two measures are here called _n-density_ (for _n_umber-density) and _w-density_ (for _w_eight- density), respectively. Frequency and weight are slightly different measures of artifact density --the one representing the quantity of items (and by implication, the intensity of use) and the other representing their mass (and by implication, the amount of material transported to the site). Use of one or the other descriptor may be more appropriate depending upon many factors. These include the size distribution of the archeological objects, as well as the speed with which the analyst wishes to make measurements.

Since both FCR and lithics are in stable states of preservation at 19BN281, the frequencies for both classes are close to what they were when the site was abandoned. In

contrast, the small fragments of bone are poorly preserved, and break into new fragments easily. The density of bone can thus only be reasonably represented by weight. In the present study convenience has played a strong role in determining which measures of density are used: catalogers recorded both counts and weights in grams for fire-cracked rock, but only counts for lithics (chipped stone debitage and implements). Fire-cracked rock can be described with equal ease by n-density or w-density, but only n-densities are readily available for lithics. Several of the tables in the following analysis report data by excavation levels. Since level numbers repeat for the two sets of excavation units, levels through Stratum I (EU's 194-199) are preceeded by "Aeol:" (for aeolian sand).

A subsample of seven excavation units provides lithic weights. EU 223 was studied in detail first, and it was selected because the soil column in the south wall provided information about the sediments in the unit. EU's 198 and 199, which were excavated through the aeolian sand over EU 223, provide flake weights in grams from the upper stratum of the site; since artifact densities are low in Stratum I, the weights from both units are here combined. Lithics from these three units were individually weighed. Four additional units were selected through a computer-generated psuedo-random numbers table (Hewlett-Packard 9845B RND function; initial seed set by RANDOMIZE function). These units represent four pattern of lithic density distribution: single level (EU's 215 and 217) or multiple level (EU's 208 and 211) peaks, centered either in Level 010 (EU's 208 and 215) or below it (EU's 211 and 217). Because of time constraints, artifacts from these four excavation units were weighed in lots defined by material and technology categories.

The densities are calculated in terms of a unit volume of 50000 cubic centimeters (here abbreviated <u>uv</u>). This is one-fifth the size of the unit volume of 250000 cubic centimeters (one-quarter cubic meter or "qcm") employed in the multisite analyses reported in McManamon (1984). Since the majority of proveniences in the 1983 excavations are 1 square meter by 5 cm, the smaller unit volume yields densities that are generally close to or identical with the raw counts or weights.

Excavation Unit Records include opening and closing depths for each level, so these notes provide the data for computation of the volumes of individual proveniences. The volume is the mean thickness of the provenience in the four corners of the excavation unit multiplied by the area of the unit. Table 2.8 provides estimated total volumes and the number of excavation units per level; the number of excavation units is the value used to compute the mean densities and standard deviations in Tables 2.9, 2.14, and 2.15.

TABLE 2.8

1983 Excavations: Excavation Units and Volumes per Level

Level	n (EU´s)	Est. Volume of Excavation (cubic meters)
Aeol:000	6 (a)	4.95
Aeol:015	6	3.82
000	33 (b)	1.656
005	33	1.65
010	33	1.648
015	33	1.658
020	33	1.649
025	33	1.645
030+	33	3.47
030	6 (c)	0.3
035	6	0.3
040	1(d)	0.05

(a) EU´s 194-199
(b) EU´s 201-233
(c) EU´s 201, 209, 210, 213, 214, 215
(d) EU´s 213

Lithics

N-densities. For the 1983 excavation area as a whole, lithics reach a peak mean n-density of 125.0/uv in Level 010; mean n-density falls slightly to 108.6/uv in the succeeding Level 015 and declines substantially (Table 2.9; Figure 2.9). The patterns of change with depth in the quartile values and standard deviation of the densities closely mirror those of the mean. These summary statistics provide a good reflection of the n-density distribution patterns in individual EU´s. Figure 2.10 displays the n-density values for EU´s 201-233, as bar graphs scaled to a percentage of the maximum density for each unit. Table 2.10 records the maximum values for the excavation units. Distributions generally are unimodal, and although a few excavation units have additional modes, these are of minor importance. No secondary mode can be traced over more than three adjacent excavation units. Visual inspection of the lithic n-densities in Figure 2.10 reveals no clustering across the excavation area for the excavation levels with the peak densities.

Mean n-densities of the two major rock types in the assemblage -quartz and felsic volcanics- also follow the pattern for the total lithic density reaching peak values in Level 010, (Figure 2.9). Percentages of rock types computed on the basis of totals/level, however, remain relatively constant through the soil column (Table 2.11). In general, mean percentages (per excavation unit per level) also vary only slightly; the greatest deviation from overall means occurs for quartz in the aeolian sand, where low frequencies produce a wide range of percentage values (Figure 2.11). Artifact densities are further considered in the discussion section of this chapter.

W-densities. Weight densities in EU´s 198, 199, and 223 and in the random subsample closely follow the patterns for n-densities (Table 2.12). An accurate estimation of w-density per level for the 1983 excavation area as a whole is not feasible because of the small sample size of the subsample and its design. However, based on the close relationship between n-densities and w-densities, it is probable that mean weight densities for lithics are low in the aeolian sand, rise to a maximum value in Level 010 and decline thereafter.

Average lithic weights. The data on individual artifact weights from EU´s 198, 199, and 223 provide additional information about the distribution of lithic artifact weights through the soil column. Artifacts from these three units range in weight from 0.07 g to 161.44 g. The distribution of weights within any given level and for all weights together tend to be skewed left and strongly peaked. Trim flakes and shatter (see Chapter 3) make up the bulk of the assemblages from all levels and contribute most of the weights under 2.0 g. Blocks, bifaces, and large flakes (including decortication flakes) (see Chapter 3) are responsible for the weights over 5.0 g. The asymmetry of the

Table 2.9

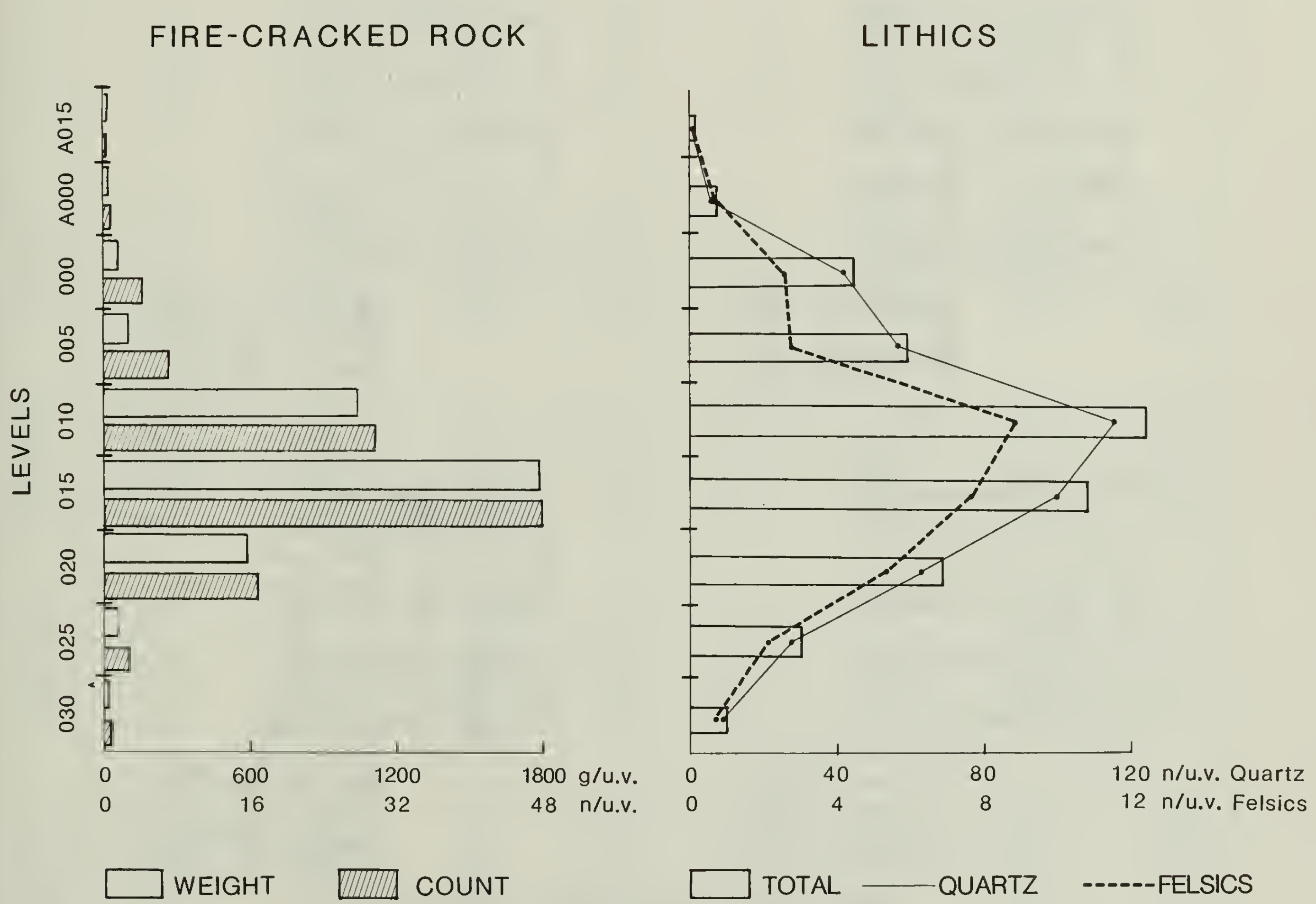
Lithic Frequency Density (n-Density) Summary Statistics

TLit/50Kcc

Level	Mean x	S. Dev. s	N (EU's)	Raw Total (T-Lith)
Aeol:L000	1.1	1.5	6	123
Aeol:L015	8.1	3.5	6	612
L000	44.9	14.5	33	1490
L005	59.7	19.2	33	1970
L010	125.0	93.2	33	4115
L015	108.6	77.5	33	3594
L020	68.7	55.1	33	2277
L025	31.1	22.7	33	1023
L030+	10.2	7.7	33	698
L030	18.3	12.1	6	110
L035	11.7	6.9	3	70

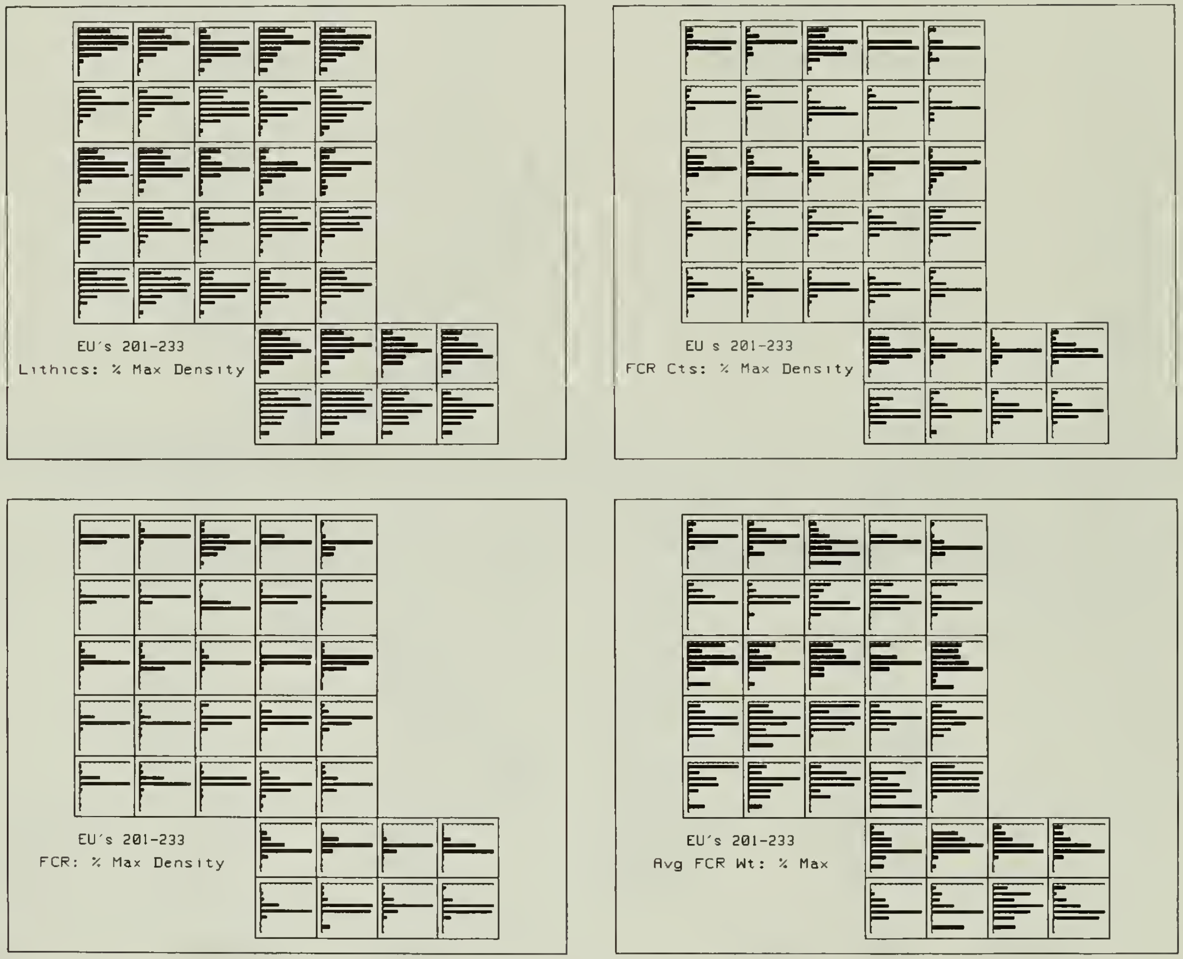
Level	Min	Quartiles 25th	50th	75th	Max
Aeol:L000	0.0	.2	.5	.7	.4
Aeol:L015	4.1	5.8	7.8	8.7	14.0
L000	16.0	33.0	44.0	54.0	76.0
L005	26.0	41.0	61.0	77.0	90.0
L010	44.0	83.0	96.4	105.0	509.0
L015	33.0	66.0	90.0	107.0	383.0
L020	16.0	34.0	48.0	83.0	280.0
L025	3.0	13.0	24.0	41.0	82.0
L030+	.5	2.9	9.0	17.0	21.5
L030	1.0	6.0	23.0	25.0	32.0
L035	2.0	9.0	10.0	10.0	22.0

Notes: Except for the raw total, values are per unit volume (500000 cm).



Mean Densities of Fire-Cracked Rock and Lithics, EU's 194-233

FIGURE 2.9



HORIZONTAL SCALES: 0 - 100% OF MAXIMUM VALUE FOR EACH EU

VERTICAL SCALES: LEVELS

VERTICAL DISTRIBUTIONS OF ARTIFACT DENSITIES, EU'S 201 - 233

FIGURE 2.10

Table 2.10

Maximum Values for Artifact Densities and Average FCR Weights, By Excavation Unit

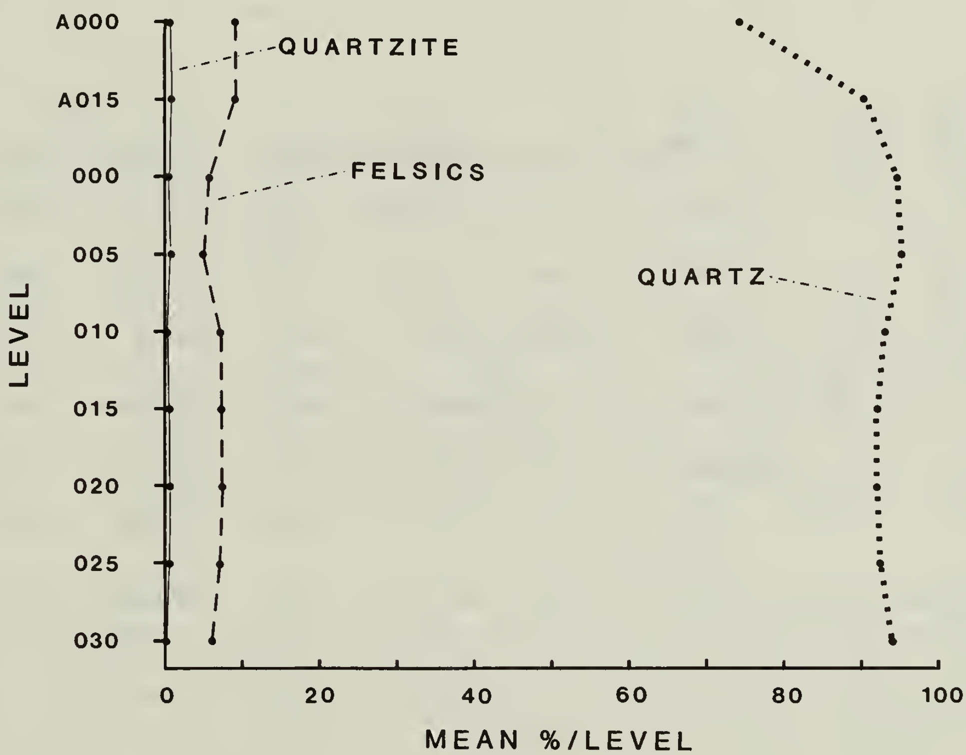
EU	Lithics lev	(n/uv) max	FCR lev	(n/uv) max	FCR lev	(g/uv) max	Avg FCR lev	Wt g max
201	005a	87.0	010	61.0	010	2873.4	010	47.1
202	010	96.4	010	58.2	010	2606.0	010	44.8
203	010	179.0	010	14.0	015	502.0	025	52.0
204	010	85.0	015	15.0	015	873.0	015	58.2
205	005	77.0	015	15.0	015	659.4	020	177.1
206	010	99.0	010	92.0	010	3010.8	015	61.0
207	010	136.5	010	47.1	010	3529.4	010	75.0
208	010b	97.0	020	50.0	020	2623.4	020	52.5
209	010	509.0	010	57.0	010	1640.0	015	37.2
210	010	183.0	015	33.0	015	1640.0	015	49.7
211	020	86.0	015	79.0	015	3761.5	015	47.6
212	015	95.0	020	103.0	015	3227.4	015	45.5
213	015	180.0	015	48.0	015	1793.0	015	37.4
214	015	327.0	010	55.0	010	1433.6	015	49.0
215	010	175.0	010	58.0	010	1217.8	020	36.8
216	015	90.0	015	101.0	015	3402.8	015	33.7
217	015	126.0	015	147.0	015	4434.5	010	40.8
218	010	345.0	010	46.0	010	1669.1	010	36.3
219	010	103.0	015	33.0	010	1151.7	010	64.0
220	005	57.0	010	19.0	010	923.5	010	48.6
221	015	91.0	015	71.0	015	2674.6	000d	62.3
222	010	105.0	015	108.0	015	3574.6	010	50.3
223	010	227.0	015	43.0	015	2416.6	010	63.4
224	015	196.0	015	55.0	015	1894.1	030d	59.6
225	010	89.0	015	78.0	015	3448.9	005d	46.5
226	015	119.0	015	34.0	020	1892.5	020	65.3
227	010	116.0	015	86.0	015	2877.6	015	33.5
228	015	72.7	015	84.5	015	3269.0	020	48.6
229	020	80.0	020	47.0	020	2506.8	020	53.3
230	010	104.0	015c	21.0	020	1454.7	020	69.3
231	010	81.0	015	46.0	015	1186.3	020	60.5
232	010	83.0	015	48.0	015	1191.3	015	24.8
233	010	101.0	015	41.0	015	1351.0	020	61.4

(a) 2 levels: 005, 010
(b) 2 levels: 010, 020
(c) 2 levels: 015, 020
(d) Avg based on <6 FCR

TABLE 2.11

Percentages of Lithic Materials by Level, EU's 194-233

Level	Quartz (%)	Quartzite (%)	Felsic Volcanics (%)	Total Lithics
Aeol:000	91.0	1.6	6.5	123
Aeol:015	90.2	0.8	8.3	612
000	93.8	0.3	5.8	1490
005	94.9	0.3	4.7	1970
010	92.5	0.2	7.1	4115
015	92.4	0.3	7.1	3594
020	91.8	0.4	7.8	2277
025	91.6	0.3	8.1	1023
030+	93.0	0.0	6.7	698



Mean Percentages of Lithic Materials
by Levels, EU's 194-233

FIGURE 2.11

TABLE 2.12

Weight Densities for Lithics, Selected Excavation Units

Level

Aeolian Sand

Level	EU 198		EU 199	
	g/uv	n/uv	g/uv	n/uv
Aeol:000	5.16	1.4	0.49	0.2
Aeol:015	19.63	5.8	8.35	8.7

Paleosol

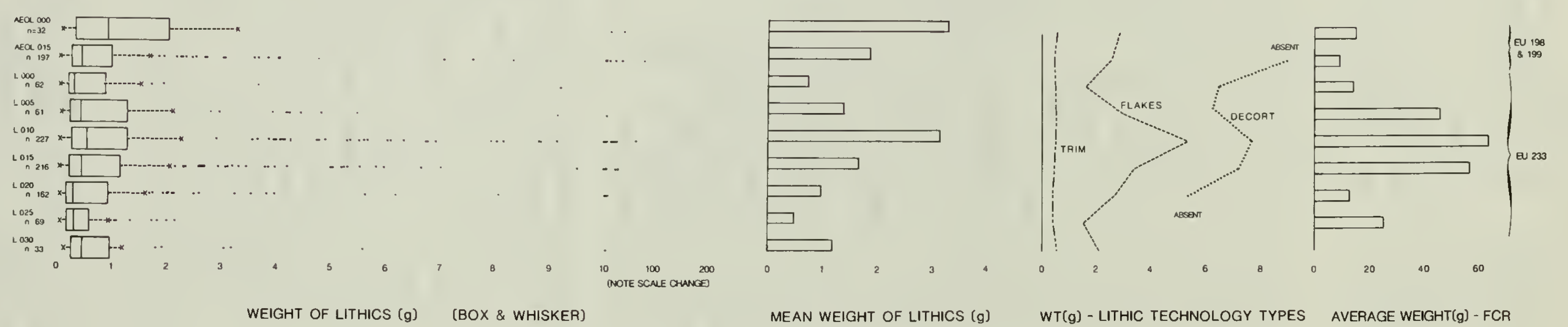
Level	EU 208		EU 211		EU 215		EU 217		EU 223	
	g/uv	n/uv	g/uv	n/uv	g/uv	n/uv	g/uv	n/uv	g/uv	n/uv
000	81.55	54	67.38	33	62.86	50	39.70	59	45.81	6[illegible]
005	48.71	46	96.62	44	34.35	32	55.25	62	85.69	6[illegible]
010	225.3	97	262.4	85	275.8	175	139.2	82	713.8	22[illegible]
015	106.6	95	434.4	79	266.9	107	263.8	126	363.8	21[illegible]
020	138.4	97	224.8	86	191.0	89	17.88	22	158.4	16[illegible]
025	41.02	40	15.5	22	9.2	16	9.04	14	32.78	6[illegible]
030+	2.42	5	2.61	9	16.03	21	4.26	1.5	19.68	3[illegible]

distributions for individual levels can be seen in the box and whisker diagrams of Figure 2.12. These diagrams depict the quartile values for the weight distribution as the three vertical lines of the box. The dotted lines are the whiskers that connect the values within one midspread (value for 75th percentile minus that of 25th percentile) of the upper and lower quartiles. More extreme values are displayed as individual dots (Hartwig and Dearing 1979: 23-25).

From ground surface to depth of excavation, average weights are trimodally distributed (Figure 2.12). The first peak is in Level 000 of the aeolian sand. The peak is probably centered between 10 and 15 cm; virtually no artifacts were recovered during the first 5 cm of excavation, and no artifacts were recovered from the 5-10 cm interval in the column sample (Figure 2.8). The second, and primary, mode is in Level 010 of EU 223, just at the bottom of the IIA horizon, and this level is also the location of the peak lithic density. The third peak is in Level 030, at the base of the excavations. Several statistics of the distribution display this pattern, including the means and the quartile values. The pattern also appears in the mean weights for the three most common technological categories --trim flakes, flakes, and decortication flakes. The case of the trim flakes is particularly instructive, for trim flakes are a size category, defined at the lower end by the sieve size used during excavation (0.25 in x 0.25 in [6.4 mm x 6.4 mm]) and at the upper end by a 2 cm x 2 cm square. Trim flakes show the same trends through the profile as the entire level assemblages, and this is a further indication that the multimodal pattern of artifacts is real and not merely a product of the presence of a few heavy artifacts (the outliers of the box and whisker diagram).

To check whether the patterns of distribution for weight and mean weight seen in EU 223 are representative of the excavation area, four other randomly selected units (EU´s 108, 211, 215, and 217) were examined. Each of the four excavation units in the subsample has its own pattern of average weights through the soil column (Table 2.13; Figure 2.13). In EU´s 208 and 217 a level with a mode of average lithic weight corresponds to the maximum lithic density. In EU 211 the peak mean weight falls between the two density modes. In EU 215 the two maxima differ by one level. EU´s 215 and 217 both have modes in Level 030; although the mode in EU 217 is the maximum mean weight for the unit, it is based on only a few artifacts (Table 2.13). Among the four excavation units in the subsample, none shows the close correspondence in changes between mean weights for total lithics and those for the flake types that EU 223 shows.

In short, the typical vertical distribution pattern for average lithic weights remains unclear. The only consistent trend (and only moderately consistent at that) is the correspondence in excavation level between a mode of mean lithic weight and a mode of lithic density.



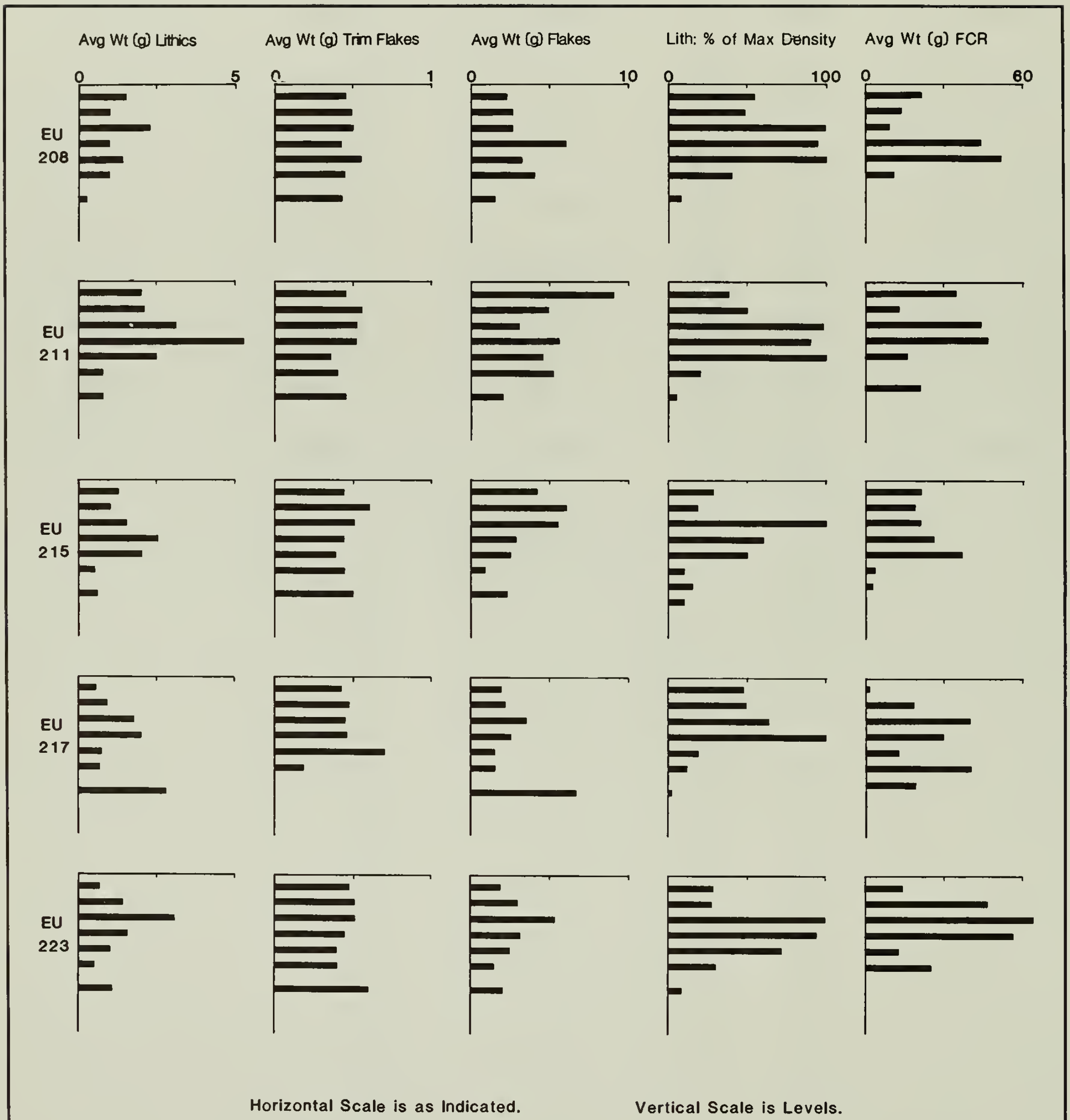
ARTIFACT WEIGHTS BY LEVEL EU'S 198-199 AND 233

FIGURE 2.12

TABLE 2.13

Mean Lithic Weights (g) per Level, Selected Excavation Units

Level	EU 208		EU 211		EU 215		EU 217		EU 223	
	x wt	n	x wt	n	x wt	n	x wt	n	x wt	n
000	1.51	54	2.04	33	1.26	50	0.65	61	0.74	62
005	1.06	46	2.20	44	1.07	32	0.88	63	1.40	61
010	2.32	97	3.09	85	1.58	174	1.76	79	3.14	227
015	1.12	95	5.43	80	2.47	108	2.04	129	1.68	216
020	1.43	97	2.61	86	2.15	89	0.78	23	0.98	162
025	1.05	39	0.74	21	0.57	16	0.70	13	0.48	69
030+	0.48	17	0.70	9	0.74	43	2.04	3	1.19	33



Mean Lithic Weights in Five Excavation Units

FIGURE 2.13

Fire-Cracked Rock

N-densities. Like lithics, mean fire-cracked rock densities are unimodally distributed through the soil profile (Figure 2.9). Level 010 shows a near peak mean n-density of 30.0/uv, and a peak mean of 48.3/uv occurs in Level 015. As with lithics, changes in quartile values and the standard deviation parallel those of the mean (Table 2.14). These average trends are a good reflection of the trends in individual EU's in the paleosol (Figure 2.10, Table 2.10). All excavation units have unimodal vertical distributions of n-densities. A few have minor secondary modes, which are of little importance. Visual inspection reveals no horizontal patterning to the level with the maximum n-density.

W-densities. Average weight densities for fire-cracked rock are also unimodally distributed (Figure 2.9). As with n-densities, Level 010 has a near peak mean value (1038.3 g/uv), followed by a peak value in Level 015 (1787.2 g/uv) (Table 2.15). Again, the other statistics for w-density follow the trends of the mean (Table 2.9). These trends are a good representation of the patterns for individual excavation units (Figure 2.10, Table 2.10).

A Pearson's r of 0.93 (n=238 [proveniences in paleosol], $p<.001$) attests to the strong correlation between FCR n-densities and FCR w-densities. In all but four EU's the two density measures reach peak values in the same level; in the remaining units, the peaks are separated by only one level (Table 2.10). The zone of maximum FCR density in Levels 010 and 015 is somewhat more sharply defined by weights than by frequencies (Tables 2.14-2.15). Level 015 has a mean w-density more than 16 times that of Level 005, but these two levels differ by only a factor of 7, as measured by mean n-density. Similarly, Level 015 has a mean density more than 31 times that of Level 025, but the difference between the two levels in n-density is only a factor of 15. For both measures, the mean density in Level 015 is 1.6-1.7 times that of level 010, and it is 2.8-3.0 times that of Level 020.

Average weights. The distribution of average fire-cracked rock weights through the soil profile is somewhat less regular than those of FCR n- or w-densities. The overall average weights for the 1983 excavation area appear to be multimodal: one mode occurs in Level 000 of the aeolian sand; the major mode occurs as a broad zone in Levels 010-020; and a third mode occurs in Level 030 (Table 2.16). A close inspection of the summary statistics reveals, however, that the means near the surface and at depth are inflated by one or a few high values. The median suggests that the distribution is nearly unimodal, with a slight decline in average weight in Level 000 of the paleosol, below that of the overlying aeolian sand. As compared to the mean, the median more sharply defines the peak value for average weight in Level 015 alone.

Table 2.14

Fire-Cracked Rock Frequency Density (n-Density)
Summary Statistics

FCct/50Kcc

Level	Mean	S. Dev.	N (EU's)	Raw Total (FCR count)
Aeol:L000	.3	.4	6	38
Aeol:L015	.9	.6	6	69
L000	4.3	3.0	33	142
L005	7.0	6.2	33	232
L010	30.0	20.2	33	988
L015	48.3	32.0	33	1604
L020	17.0	19.5	33	559
L025	3.1	3.4	33	102
L030+	.7	1.2	33	49
L030	.5	1.2	6	3
L035	.2	.4	6	1

Level	Min	Quartiles 25th	50th	75th	Max
Aeol:L000	0.0	0.0	.2	.3	1.2
Aeol:L015	.4	.6	.7	.8	2.1
L000	0.0	2.0	4.0	6.0	9.0
L005	0.0	3.0	5.0	9.0	31.0
L010	4.0	14.0	25.0	35.0	92.0
L015	6.7	29.0	42.0	55.3	147.0
L020	0.0	7.0	12.0	20.0	103.0
L025	0.0	0.0	3.0	4.0	13.0
L030+	0.0	0.0	0.0	1.0	5.0
L030	0.0	0.0	0.0	0.0	3.0
L035	0.0	0.0	0.0	0.0	1.0

Notes: Except for the raw total, values are per unit volume (50000 cm).

Table 2.15

Fire-Cracked Rock Weight Density (w-Density)
Summary Statistics

gFCR/50Kcc

Level	Mean	S. Dev.	N (EU's)	Raw Total (FCR)
Aeol:L000	5.9	8.0	6	660.3
Aeol:L015	12.0	10.9	6	895.6
L000	62.8	61.1	33	2076.8
L005	109.4	96.3	33	3610.6
L010	1038.3	935.6	33	33994.3
L015	1787.2	1126.4	33	59439.4
L020	595.2	729.7	33	19574.1
L025	57.0	74.1	33	1864.0
L030+	14.7	35.1	33	1030.7
L030	1.5	3.6	6	8.7
L035	2.7	6.6	6	16.2

Level	Min	Quartiles 25th	50th	75th	Max
Aeol:L000	0.0	0.0	2.3	3.4	19.8
Aeol:L015	3.5	7.0	8.1	8.7	33.5
L000	0.0	25.0	47.5	68.0	250.6
L005	0.0	40.9	101.0	137.8	404.1
L010	44.4	282.7	939.3	1217.8	3529.4
L015	220.0	1030.2	1419.6	2416.6	4434.5
L020	0.0	120.0	225.7	918.9	2623.4
L025	0.0	0.0	18.0	74.5	251.5
L030+	0.0	0.0	0.0	12.5	187.9
L030	0.0	0.0	0.0	0.0	8.7
L035	0.0	0.0	0.0	0.0	16.2

Notes: Except for the raw total, values are per unit volume (50000 cm).

TABLE 2.16

Average Fire-Cracked Rock Weights (g): Summary Statistics

Level	Mean	Min.	Percentiles 25th	50th	75th	Max.	n
Aeol:000	17.4	0.0	0.0	6.7	9.1	51.0	38
Aeol:015	13.0	4.9	9.1	12.8	16.3	18.4	69
000	14.6	0.0	7.0	10.2	17.6	62.3	142
005	15.6	0.0	9.0	13.0	17.8	46.5	232
010	34.4	9.2	19.8	26.6	40.8	75.0	988
015	37.0	24.7	32.3	37.2	44.2	62.4	1604
020	35.0	0.0	13.4	22.0	42.6	177.1	559
025	18.3	0.0	0.0	8.0	17.2	54.6	162
030+	21.0	0.0	0.0	0.0	6.2	59.6	49

Many of the individual excavation units in the paleosol appear to have more than one mode (Figure 2.10, Table 2.10). Most noticeable are those EU's with a high average weight in Level 000, succeeded by a lower average in Level 005. This pattern is most common between N99 and N103 (EU's 206-225). In all cases these high averages were produced by only a few rock fragments (always 8 or fewer), so the prominence of the peaks may be an artifact of small sample sizes.

The distribution through the profiles of overall average fire-cracked rock weights (Table 2.16) parallels the pattern for n-density (Table 2.14) and w-denisty (Table 2.15). One or both of the density values reaches a peak in the same level as the peak for average FCR weight (Table 2.10) in 18 of the 33 excavation units. This number would increase somewhat if some of the peak values based on low numbers of fragments were ignored and the next highest value for these few cases were compared instead. However, when the entire patterns for average weight and density are compared through all profiles, the relationship is not as strong as it is between n-density and w-density. Pearson's r statistics are consequently lower: average weight and n-density have a correlation coefficient of 0.39 and average weight and w-density have a coefficient of 0.54 (n=238 in both cases).

Comparisons Between Lithics and FCR

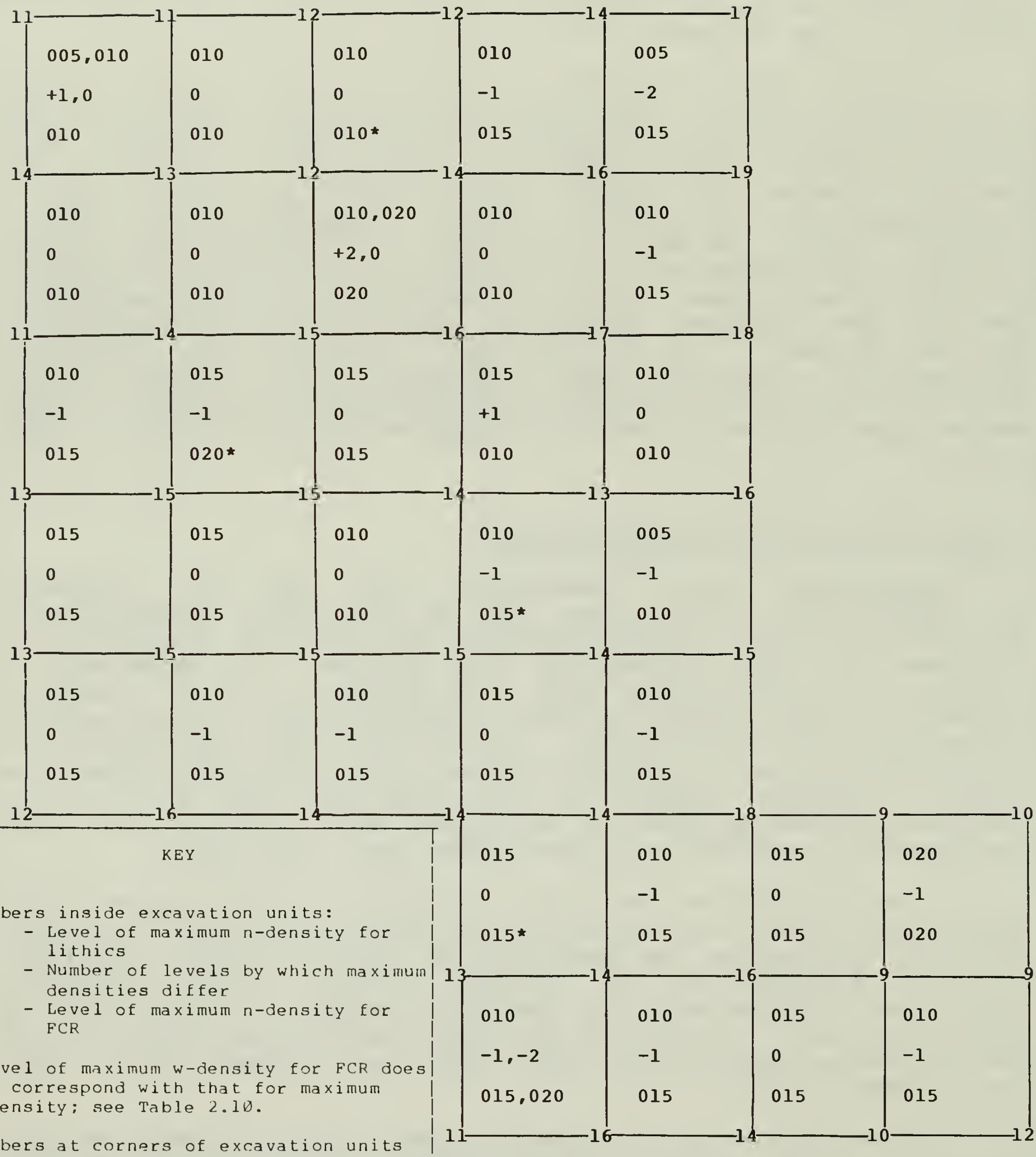
Densities. Since n-densities for FCR are strongly correlated with w-densities, use of only one of these measures for comparison with lithic densities is reasonable. The data are complete for the n-densities for lithics, so these will be compared to fire-cracked rock n-densities. On the basis of overall trends within the 1983 excavation area, lithics reach a maximum density in Level 010, and fire-cracked rock peaks in Level 015 (Figure 2.9, Tables 2.9 and 2.14). The IIA horizon has a mean thickness within the 1983 excavation area of 14 cm. On average, the maximum density of lithics seems to occur just above the boundary, and that of fire-cracked rock, just below.

An examination of individual excavation units supports these observations, but also indicates a somewhat more complex picture. Figure 2.14 compares the levels having peak artifact densities with the location of the IIA/IIB boundary. Three excavation units have multiple peaks for artifact density: two for lithics (EU's 201 and 208) and one for fire-cracked rock (EU 230). In the following discussion each peak is counted as a half occurrence (0.5 EU).

In 58% of the EU's (19 occurrences) lithics reach a maximum density in Level 010, and in 14 of these occurrences (74% of the 19) the IIA/IIB boundary is also located in Level 010. In 59% of the EU's (19.5 occurrences), fire-cracked rock reaches a maximum density Level 015; of these EU's, 74% (14.5 occurrences) have the

FIGURE 2.14

Depths of IIA/IIB Boundry and Locations of Maximum Artifact Densities EU's 201-233



KEY

Numbers inside excavation units:
- Level of maximum n-density for lithics
- Number of levels by which maximum densities differ
- Level of maximum n-density for FCR

*Level of maximum w-density for FCR does not correspond with that for maximum n-density; see Table 2.10.

Numbers at corners of excavation units are depths (cm below I/II interface) of the IIA/IIB boundary, determined from profile drawings.

IIA/IIB boundary in the overlying level. Level 015 accounts for most of the remaining lithic density maxima (10-30%), and in all of these the IIA/IIB boundary is in Level 010. Level 010 accounts for most of the remaining FCR peaks (10-30%); in eight of these, the IIA/IIB boundary is in Level 010. Examination of individual EU's supports the trends suggested by the overall values for the location of fire-cracked rock and lithic peaks in relation to the IIA/IIB boundary. However, comparison between the average density distributions in Figure 2.9 and those of individual EU's in Figure 2.10 indicates that most units have a more sharply defined zone of maximum density than shown by the overall average (generally one level, as opposed to the two implied by the average). The width of the zone in the averages is largely a result of the large number of EU's with peak densities in the non-modal level (i.e., Level 015 for lithics, Level 010 for fire-cracked rock).

Examining the locations of peaks of lithic density and of density together indicates that most commonly, in 32% of the EU's (10.5 occurrences), lithics reach a maximum density in Level 010 and fire-cracked rock peaks in the succeeding Level 015. This is followed closely by 24% of the EU's (8 occurrences) in which both densities peak in Level 015 and 23% of the EU's (7.5 occurrences) in which both peaks in Level 010. In total, 52% of EU's (19 occurrences) have lithic and FCR peaks in the same level, 45% (15 occurrences) have lithic peaks above FCR peaks, and 3% (1 occurrence) have a lithic peak below that for FCR. Thus, it is more accurate to say lithics reach maximum densities in the same level as fire-cracked rock or just above maximum FCR densities.

Excavation units with co-occurring lithic and FCR peaks are most common along the NW-SE axis of the excavation area, but the excavation area is not large enough to determine whether this pattern represents true clustering or is merely a product of random effects.

Average Weights. Given the small sample size for average lithic weights and the irregular nature of the distribution of average fire-cracked rock weights, it is difficult to make a thorough comparison between them. In EU's 198-9 and 223, changes in average lithic and average weights parallel one another. In the other four EU's the maximum values for average lithic weights generally occur within one level of those of fire-cracked rock (Figure 2.13). These observations bear on questions of depositional history, site stratification, and movement of artifacts through the profile, as discussed in the final section of this chapter.

Other Artifacts

Table 2.17 summarizes the distribution of bone, shell, prehistoric ceramics, and historic artifacts. The historic artifacts comprise two machine cut nails and one unidentifiable

TABLE 2.17

Vertical Distributions of Other Artifact Classes

Level	Bone (g)	Shell (g)	Pottery n	Pottery wt (g)	Historic Artifacts
Aeol:000	0.0	0.238	0	0	1
Aeol:015	1.153	0.386	5	0.65	1
000	0.336	4.307	3	0.80	0
005	1.450	0.438	4	1.45	0
010	2.762	2.265	0	0	1
015	6.993	0	2	3.09	0
020	3.964	0	0	0	0
025	2.885	0	0	0	0
030+	2.657	0	0	0	0

fragment of ferrous metal. All assemblages are small, but the distributions of shell, pottery, and the historic artifacts are centered higher in the profile than the densest portion of the lithic and fire-cracked rock assemblages. The summary distributions of bone, in contrast, most closely parallels that of fire-cracked rock.

Discussion

Paleosol: Origin and Genesis

Stratum II is the upper meter of the Truro outwash plain (Koteff et al. 1967; Oldale 1976:13, 1982:28) at 19BN281. This unit was deposited as glacial outwash about 16000 BP, and the values derived from the grain size analyses reflect this origin. Differences in texture among the samples of the IIB and IIC horizons hint that the sediments originally had microstratification, which has now been obscured. As deposition of outwash came to an end, the ground lay exposed for some time; during this period wind streaming off the nearby glacier created a lag gravel of ventifacts (Strahler 1966:89-90;, Oldale 1976:18). The lag gravel now lies about 60 cm below the I/II interface (about 90 cm BS) in the area of the 1983 excavations, and the gravel was probably buried by meltwater sediments during the final period of deglaciation.

Soils began to develop by about 12000 BP, when the first extensive plant communities had established themselves (Winkler 1985). Over the succeeding millenia, forests grew on the site, and a podzolic soil developed. Sometime between about 4500 BP and 3000 BP (see Chapter 4), the major period of occupancy of the site took place. Prehistoric people transported quantities of stone and organic materials to the site and deposited them as stone tools and debitage, fire-cracked rock, and bone, among other artifacts. Subsequent prehistoric use of the area appears to have been minimal, and the site remained forested until shortly before the aeolian sand sheet buried it.

Aeolian Sand

Age. Four lines of evidence indicate that Stratum I is less than 350 years old, and the best estimate further reduces this to an age range begnning not earlier than about A.D. 1750 and ending around 1900.

Lack of soil development, first noted during the 1980 excavations, indicates that the aeolian sand is fairly recent, but does not allow a more precise age estimate than one of less than a few hundred years.

The discovery of plowscars at the I/II interface during the 1983 excavations clearly indicates that the aeolian sand must post-date the period of European contact. During the late eighteenth and nineteenth centuries agricultural technology advanced rapidly. A careful study of the shape and spacing of the plowscars might reveal the type of plow responsible, permitting a fairly accurate estimate of the date of burial of the interface.

The recovery of two metal objects from Stratum I and one from Stratum II further supports a post-Contact age for the windblown layer. Two of these objects are machine cut nails --one from Stratum I (195-00-000) and one from Stratum II (214-00-010). Manufacture of machine cut nails about 1795 and, this type of nail was widely used until around 1900 (Nelson 1968:8, 10). Their locations beneath (though possibly intruded into Stratum II) and near the top of Stratum I suggests that the windblown layer is predominantly a nineteenth century deposit.

The final line of evidence is documentary. North Truro was converted to farm land during the first two-thirds of the eighteenth century, and this provides a beginning date for the deposit. The Town of Truro was incorporated in 1709, a decade after people from Eastham began settling there (Clemenson 1979:68), and some two decades after ten proprietors purchased from the Pamet Indians the land between East Harbor (Pilgrim Lake) and Bound Brook (Rockmore 1979:19). The exact date of settlement at High Head is uncertain, but town records indicate there were pastures and perhaps dwellings around East Harbor by the 1720's (Rockmore 1979:25). According to several late eighteenth and nineteenth century sources examined by Rockmore (1979:24-6), there was a small community, having as many as 23 dwellings and a windmill, that flourished near East Harbor until about 1800.

By the mid-nineteenth century, High Head had less than a dozen houses, but numerous fenced fields or pastures. The 1857 edition of U.S. Coast Survey chart 616 suggests the area was an open landscape with an unstable topography of blowing sand. The chart shows no expanses of woodland at High Head and uses dashed contour lines. Woods are mapped in southern Truro, Wellfleet, and Eastham on the adjoining chart No. 260 (U.S. Coast Survey 1848), and this chart generally shows topography with solid contour lines. The sandfields around Sunken Meadow in South Wellfleet are mapped on chart 260 with dashed lines, and chart 616 uses dashed lines for the dunes of the Provincelands. Farming appears to have ended in the area by the beginning of the third decade of this century. Moffett (1959:1) reports that the Warren Small farm, which was located about 500 m northwest of 19BN281, was abandoned in about 1920. Airphoto GS-F-4-209 (National Archives Record Group 57), taken on 21 November 1938, shows an established grass and shrubland covering the site, indicating that the ground had not been disturbed for some years.

Source and transport. Three potential sources can be identified for the sediments comprising Stratum I: the dunefield of the eastern end of the Provincelands Hook; foredunes of mid-Holocene age capping the fossil marine escarpment; and nearby Truro plain sediments. The first two sources made no more than minimal contributions to Stratum I. The two control samples from Head of the Meadow Beach provide an indication of the texture and sorting likely to be seen in sediments from these sources. The sediments of Stratum I have a finer mean size and are more poorly sorted than the Head of the Meadow samples. Sediments from the Provincelands would have to be transported across Pilgrim Lake and up the escarpment, probably yielding a fine, very well sorted sediment. Suggesting that nearby mid-Holocene foredunes are a major sediment source requires the additional hypothesis that such a landform existed in the first place.

Nearby glacial drift is thus the strongest candidate for the source of the Stratum I sediments. The analyses presented earlier in this chapter indicate the close similarities among the textures of Strata I and II and the High Head controls. Sand grains from these three sources are all coated with clay minerals and stained yellowish brown by clays and iron oxides. The grinding of grain against grain in the shore zone and in the dunefields have removed such coatings from the Head of the Meadow samples and from the sands of the Provincelands.

The differences between Stratum I and the Truro plain glacial drift, represented by Stratum II, are consistent with short-distance transport of the sediment by wind. Stratum I has a much lower proportion of gravel, which would be left as a lag close to the source, and a somewhat lower percentage of fines, which, once airborne would be carried far beyond the site. Glacial drift exposed in fields and on the scarp face to the north and west of the site, in the direction of the prevailing winds (Leatherman and Godfrey 1979:225), probably supplied most of Stratum I sediment.

Depositional history. The eighteenth century people of Truro cleared the woodlands and forests, including those of site 19BN281, for fields and pastures. This may not have been the first time the woods at High Head were opened for agriculture, for the Late Woodland people of Cape Cod also cultivated crops. However, the extent of Colonial clearing was many times that of any previous cutting. Once the forests were gone, poor agricultural practices made the landscape vulnerable to wind erosion (Altpeter 1937; McCaffrey and Leatherman 1979; Winkler 1985) How soon after clearing this environmental degradation began at High Head is unknown.

Site 19BN281 was cultivated for crops. Plowing stirred the upper 10 cm of the soil (see following section). Eventually, the wind began eroding soil at High Head and transporting it. Profiles of a few of the 1980 excavation units show that in some places the wind partly or entirely removed the A-horizon. Little

or no wind erosion appears to have taken place in the 1983 excavation area, and the sharp upper boundary of the paleosol indicates that burial was a rapid event. A slightly coarser sediment was at first deposited on the field; perhaps furrows tended to differentially trap somewhat larger sand grains.

Plowing appears to have continued during much of the burial of this portion of the site. In a few areas of 19BN281, Stratum I has bedding, which would not survive plow disturbance. Initially the plowshare penetrated a thin veneer of wind-blown sand, leaving the plowscars discovered in the 1983 excavation area. The artifacts in Stratum I are much larger than the non-cultural gravel and lack extensive wind polish, and thus are probably not wind-transported. It seems likely that as the sand sheet thickened, the plow occasionally penetrated the paleosol, dragging artifacts into the aeolian sand. Finally, the field was abandoned, and natural processes began to revegetate and stabilize the sand sheet.

Evidence of Stratification

The physical characteristics of the sediments do not suggest any finer stratification of the site than the differentiation of paleosol from aeolian sand. An examination of the vertical distribution of artifacts indicates a similar conclusion. Various measures of artifact density all show that lithics and fire-cracked rock are unimodally distributed through the soil column. Among lithics, this applies not only to the class as a whole but for rock types and technology types as well. Proportions of lithic materials also vary little in profile. Overall, the distribution of bone is similar in shape and location to fire-cracked rock and lithics. In contrast, the majority of pottery and shell is located somewhat above that of these other classes. This data indicates that two components may exist at the site: one comprised of lithics, fire-cracked rock, and bone and the other, a minor manifestation, represented by pottery and possibly shell. The pottery is for the most part quite small and may have been blown into the area during the deposition of Stratum I. The shell may be prehistoric, possibly contemperaneous with the pottery; it is also possible that the shell was deposited during the historic period as fertilizer and was incorporated into the upper portion of Stratum II by plowing.

Evidence also suggests that plowing has not completely disrupted the IIA horizon. If plowing had significantly altered the palesol before burial, the body of the IIA horizon should have a density mode (perhaps the primary mode) separate from one that occurs at the base of the IIA horizon or below. Plowing seems to have penetrated to the base of the plowscars and no deeper, causing artifact movements in the upper 5-10 cm of the IIA horizon but not affecting the bulk of the artifact assemblage. The large sherd from 210-00-015 and the machine cut nail at about 11 cm BI in EU 214 may both have been introduced

into the paleosol by plowing. One objection that may be raised to this interpretation is that the width of the excavation levels may mask the true patterning of artifacts in the IIA horizon. This is a reasonable comment but one that can be met by pointing out that in a substantial minority of cases the peak in artifact density occurs in the IIB horizon where plowing indisputably did not reach. A more precise picture of artifact distributions in the soil profile could only be achieved through recording the precise horizontal and vertical proveniences of artifacts.

The unimodal nature of the artifact distributions means that further analysis of lithics and fire-cracked rock can concentrate on horizontal location alone because the vertical locations are of little or no chronological significance. This does not mean that every artifact is attributable to the major episode of site occupancy, but that other criteria are needed to associate artifacts with components or to distinguish occupations within a component. On the other hand, there is no reason to treat the ceramics as contemporaneous with the Late Archaic lithic assemblage. Analyses of artifact forms, manufacturing technologies, and raw materials are needed to determine the number and nature of the components represented at 19BN281.

This study thus supports the conclusion of Borstel (1984a:199-203) that most commonly artifacts are unimodally distributed through the soil at 19BN281. It reinforces this conclusion by showing that the pattern occurs not only for lithics, but also for other artifact classes. It also supports the conclusion of the previous study that the site is less disturbed by historic land use than most other sites in the Seashore.

Vertical Movement of Artifacts

Lithics at 19BN281 are distributed quite similarly to those of John´s Bridge, a single component Early Archaic site in Vermont. According to the analysts, artifacts at John´s Bridge reach "a relatively sudden peak about 15% of the way into the B-horizon, followed by a steady decrease to the bottom of the B-horizon" (Thomas and Robinson 1980: 30). The slightly higher position of the peak at 19BN281 may reflect differences in age of the site, the site sediments, or the analytical procedures. The distribution patterns at both sites occur independently of material (Thomas and Robinson 1980: Figure 12; compare Figure 2.9 of this chapter).

Thomas and Robinson (1980) report no investigations of the distribution of artifact size comparable to those reported in this chapter. The results in the present study do not indicate clear trends in the relationship between mean artifact weight and depth. The lack of a consistent relationship indicates that the previously hypothesized relation between size and rate of movement into soil profile (Borstel 1984a:202-203) is incorrect.

Finally, in the present study a number of different statistics all reveal approximately the same distribution pattern. In addition, n-density and w-density for both lithics and fire-cracked rocks tend to be highly correlated. This indicates that future analyses may employ a single density measure and fewer statistics to describe the vertical patterning of artifacts.

Summary and Conclusions

1. Site 19BN281 has two major strata: a podzolic paleosol (Stratum II) overlain by a layer of aeolian sand (Stratum I).

2. Stratum I was deposited during some interval between A.D. 1750 and 1900 by wind carrying sediment from exposures of glacial drift that lay close to the site.

3. Artifacts in Stratum II provide evidence for only a single cultural stratum. Lithics generally reach peak densities at the base of the IIA horizon, and fire-cracked rock peaks in the same level, or just below. The model proposed for the distribution of artifacts at the John's Bridge site in Vermont (Thomas and Robinson 1980:11-40) applies to 19BN281 as well. Plowing appears to have disrupted only the top 5-10 cm of the IIA horizon. Lack of distributional evidence for stratification means that the analysis of the artifacts can concentrate on their horizontal locations alone.

4. Peak mean artifact weight shows no clear relationship with horizon or depth.

CHAPTER 3

The Artifacts

This chapter describes the artifacts recovered in 1983 and the horizontal distributions of these materials. The descriptions permit comparisons with materials from other sites for chronological and cultural taxonomic assessments. The chapter provides observations on the manufacture, maintenance, use, and discard of artifacts, because these contribute to an understanding of what the occupants did while at 19BN281 and how the site functioned within the group's settlement system. This report seeks to move beyond previous analyses of artifacts recovered by the survey (e.g., McManamon 1982, 1984d; Borstel 1984c) by examining tool groups, tool attributes, and debitage, rather than by looking at densities of debitage groups alone.

The chapter has three major sections. The first section provides a background to the analysis; it summarizes the results of previous studies of the site's artifacts and describes the analytical orientation and methods. The second section describes the artifacts; it is organized by class (manufacturing technology). The third section describes the spatial distributions of the artifacts.

Background for Analysis

Previous Studies

McManamon (1984d,e) and Borstel (1984c) both include data on chipped stone artifacts from 19BN281 in their studies of the results of the 1979-1981 field seasons of the park archeological survey. Other classes of artifacts recovered at 19BN281 --battered and ground stone tools, ceramics, and historic artifacts (metals)-- have not been previously described.

Borstel (1984c) focuses on potential sources of raw materials for stone tool making and the types of rock available

from local sources. Erosion along the exposed portions of outer Cape Cod's shoreline supplies the beaches with quartz, quartzite, and felsic volcanic stones, all of which are suitable for chipped stone tool manufacture. For reasons of efficiency, prehistoric people may have began cobble reduction close to the beaches. Specialized lithic reduction stations, where nothing but tool manufacturing took place, may be absent from the archeological record on outer Cape Cod because they have been eroded away.

Use of locally procured stones requires cobble-based, as opposed to bedrock-based, extraction strategies. Cobbles may have served as cores for the production of flakes that were subsequently made into tools, or the cobbles themselves may have been shaped directly into tools. Quartz pebbles tend to be smaller than those of quartzite or felsite, and they tend to have internal weaknesses, which result in higher proportions of blocky debitage. These characteristics may have affected the tool-making methods of the site's inhabitants. The assemblage from a single site, such as 19BN281, is insufficient to evaluate these hypotheses for the outer Cape as a whole. However, the 19BN281 artifacts can provide one case study to help refine these ideas.

Borstel (1984c) makes the following specific observations about 19BN281:

1. A surprisingly low proportion of weathered felsic volcanic rocks occur at the site, perhaps because catalogers applied the definition with great stringency (Borstel 1984c:313).

2. Compared to most other sites in the survey's sample, 19BN281 shows a high proportion of decortication flakes (Borstel 1984c: 319, 325). It is unclear whether this difference arises from the extensive use of quartz at the site and the characteristics of this material, or whether the difference is a product of the activities that took place at the site.

McManamon's (1984d, 1984e) analyses identify types of archeological deposits and stages of stone tool manufacture at 17 prehistoric sites. The analysis of archeological deposits (McManamon 1984d:1-22) compares densities of lithics (n/.25 cubic meters), shell (g/.25 cubic meters), and fire-cracked rock (g/.25 cubic meters) among the 176 concentrations that compose the sites. Deposits are not merely primary or secondary (McManamon 1984d:2), but concentrations are "arranged on a more or less continuous scale from dense and diverse deposits to dispersed and simple ones" (McManamon 1984d:22). Comparisons of percentages of lithic technology types among the concentrations provide evidence for at least three stages of chipped stone tool manufacture: primary (early stages of production), secondary (late stages of production), and tool maintenance (McManamon 1984d:22-40). Although the approach is somewhat mechanistic, the results provide "a general picture of the quantitative and spatial variation in the activities associated with lithic maintenance,

and manufacture" (McManamon 1984d:32). McManamon then synthesizes these results with floral, faunal, and ceramic data to produce a four-fold classification of concentrations, consisting of: primary deposits, limited activities; primary deposits, wide range of activities; secondary deposits, shell midden; and secondary deposits, general midden (1984e:369).

In the course of the these analyses, McManamon concludes that most assemblages at 19BN281, including Concentration 281.43, the location of the 1983 excavations, are dominated by the products of "late stage manufacturing and tool maintenance rather than primary manufacturing" (1984d:40). The site also has four concentrations where indicators of primary manufacturing are present, along with evidence of secondary manufacturing and tool maintenance; one of these is Concentration 281.42 (McManamon 1984d: Table 9.14), immediately adjacent to Concentration 281.43 (see Figure 1.4).

Along with indications of a fairly wide range of lithic activities at the site, 19BN281 also has extensive areas with high lithic and/or fire-cracked rock densities. The 1979 and 1980 fieldwork at the site produced a minuscule amount of faunal material, and in comparison with sites 19BN308, 19BN341, and 19BN288 (among others at Nauset) (Figure 1.1), virtually no shell. McManamon (1984e:377-383) suggests that shells are absent because the prehistoric inhabitants did not discard them on the site, and not because of poor preservation. This set of characteristics indicates that the archeological record at 19BN281 is composed of primary deposits, and 13 concentrations, including 281.41 through 281.48 (Figure 1.4), represent a wide range of activities (McManamon 1984e:16,17). The deposits are probably the product of overlapping, repeated, small, short-term occupations, and not "anything like a village settlement" (McManamon 1984e:380).

Analysis of the artifacts from the 1983 excavations at 19BN281 can begin to evaluate these suggestions by carefully examining the bifaces for evidence relating to manufacture and use. Analysis of the distribution of artifacts within the 33 square meters area may help to confirm the hypothesized community pattern at the site. The issues raised in this section are discussed in later portions of this chapter and in the following chapter.

Orientation and Procedural Notes

This chapter describes the assemblage recovered in 1983 by dividing the artifacts into a number of analytical fields or classes. Classes are broad categories of artifacts, and all artifacts in a given class share certain characteristics in common. The characteristics of some classes encompass a sufficiently large and sufficiently variable population of artifacts that they require further subdivision (groups and

subgroups). The subdivisions employed here are defined by one or more attributes of morphology or technology.

Chipped stone tools and debitage are the most numerous and receive the greatest amount of attention. Description and analysis have been a multi-step process. Initial sorting and classification was accomplished in the field, using the standardized Cape Cod National Seashore archeological survey cataloging system. This field catalog is stored both as a paper record and as computer files through the Hewlett-Packard Basic Statistics and Data Manipulation package running on a model 9845B minicomputer. McManamon (1982:8;1984d:Table 9.9) provides definitions of technology categories for the system, and Borstel (1984c:Table 15.6) provides definitions of raw materials. The analysis gave no further systematic attention to flake debitage (general flakes, blocks, etc.), but the author repeatedly examined samples to gain a sense of the range represented by these materials.

The analysis devoted considerable effort to sorting the bifaces. Essentially, the author undertook repeated trial sorts by hand until achieving a satisfactory taxonomy. The taxonomy has two major dimensions: stage and form. Stage is a hypothetical step (or degree of finish) in the manufacturing process, defined by the regularity of the outline plan, the thickness of the sections, and the flaking pattern. Form is the generalized outline plan. A majority of the bifaces could be placed into one of the nine non-stemmed biface and two stemmed biface taxa. A few bifaces did not fit into one of these eleven categories, either because of fragmentation or for some other reason (e.g., indeterminacy of form). These fell into miscellaneous stemmed and non-stemmed biface categories.

The bifaces are described using metric and non-metric attributes. Appendix 3 provides the details of the attribute systems, and Appendix 4 provides individual measurements for all bifaces.

Several caveats are in order. An underlying assumption is that the assemblage represents a single component. If this is so, then it is reasonable to assume that the artifacts were produced within a single technological system. By extension, the classification based on the attributes of regularity of plan, flaking pattern, and section thickness becomes a plausible series of manufacturing steps. If two or more components each contributed large numbers of artifacts to the assemblage, then sorting should recognize several different forms and/or manufacturing sequences. If, however, the assemblage is composed primarily of material from one component, with small numbers of artifacts from one or more minor components, the major and minor elements may be subsumed together. Treating the assemblage as a single component may also mask changes through the period of occupation in the technological system.

In addition, stone working is a dynamic process, and classification may obscure this aspect of the process. The current approach seems to be an improvement over the authors past efforts (Borstel 1982), but the tendency to obscure the dynamism of stone working has not been eliminated. Finally, the classification uses broken or worn preforms and tools to create a hypothetical manufacturing sequence. This may bias the picture by emphasizing failures, rejects, and final forms over successful forms that moved through to completion and in to use.

The attributes for some of the other classes are derived from other publications and consultations. The terminology and attributes for ground stone tools follow Sanger (1973). Pottery is described within the system developed by Childs (1984). Historic artifacts were categorized in consultation with Jeannine Disviscour and Darcie MacMahon of the Archeological Collections Management Project at the Eastern Archeological Field Laboratory. Arthur Spiess of the Maine Historic Preservation Commission provided the faunal identifications under contract to the National Park Service (Spiess 1984, 1985). Alison Dwyer checked the sorting of the shellfish within the system described by Hancock (1984).

Non-Stemmed Bifaces

Group 1: Lanceolate Bifaces

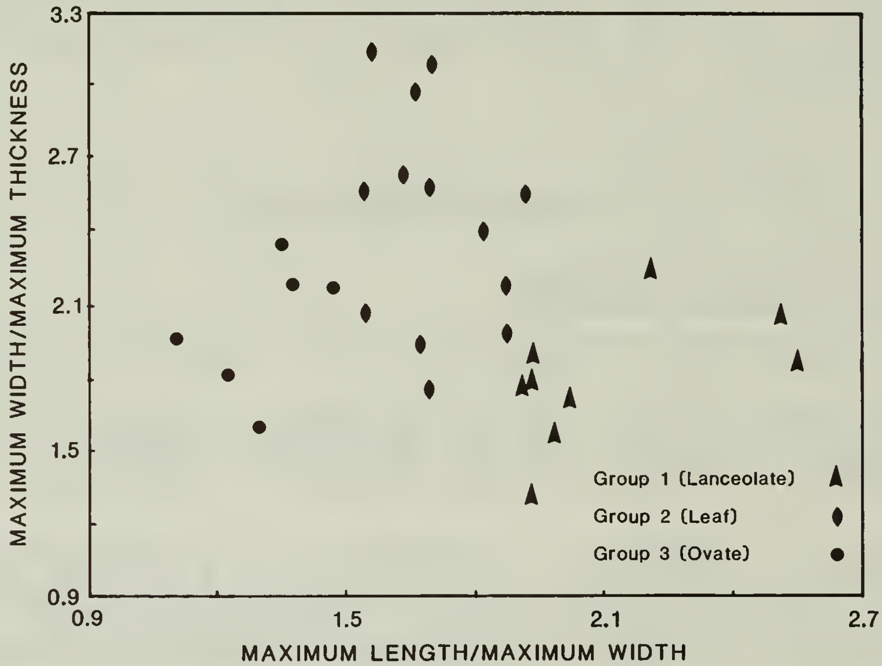
Number:41 Tables:3.1-3.2 Figures:3.1-3.2

These bifaces are relatively long and narrow. Proximal ends are rounded or squared. Blade edges are straight or excurvate and intersect at a sharply acute angle at the distal end.

Group 1A. Plan is irregular, but generally lanceolate. Cross-sections are thick; large unthinned lumps are common on one or both surfaces. Edges are wavy. Only large, deep flake scars, reaching from the edge to the biface mid-line, are present.

Group 1B. Plan varies from somewhat irregular to regular. Cross-sections thinner than Group 1A, and bifaces are smaller overall. Some bifaces have unthinned lumps on one surface, but these are less common than in Group 1A. Edges are wavy. Bifaces generally shaped only by large primary flake scars, reaching the mid-line of the biface. Two of the bifaces clearly are modified flakes (Specimens 16342 and 16405), with most of the reduction on the dorsal surface and very little modification of the ventral surface.

Group 1C. Plan is generally regular. Cross-sections about as thin as Group 1B bifaces, but 1C bifaces somewhat smaller. Unthinned lumps on faces occur on a minority of the sample.



Proportions of Complete Non-Stemmed Bifaces

FIGURE 3.1

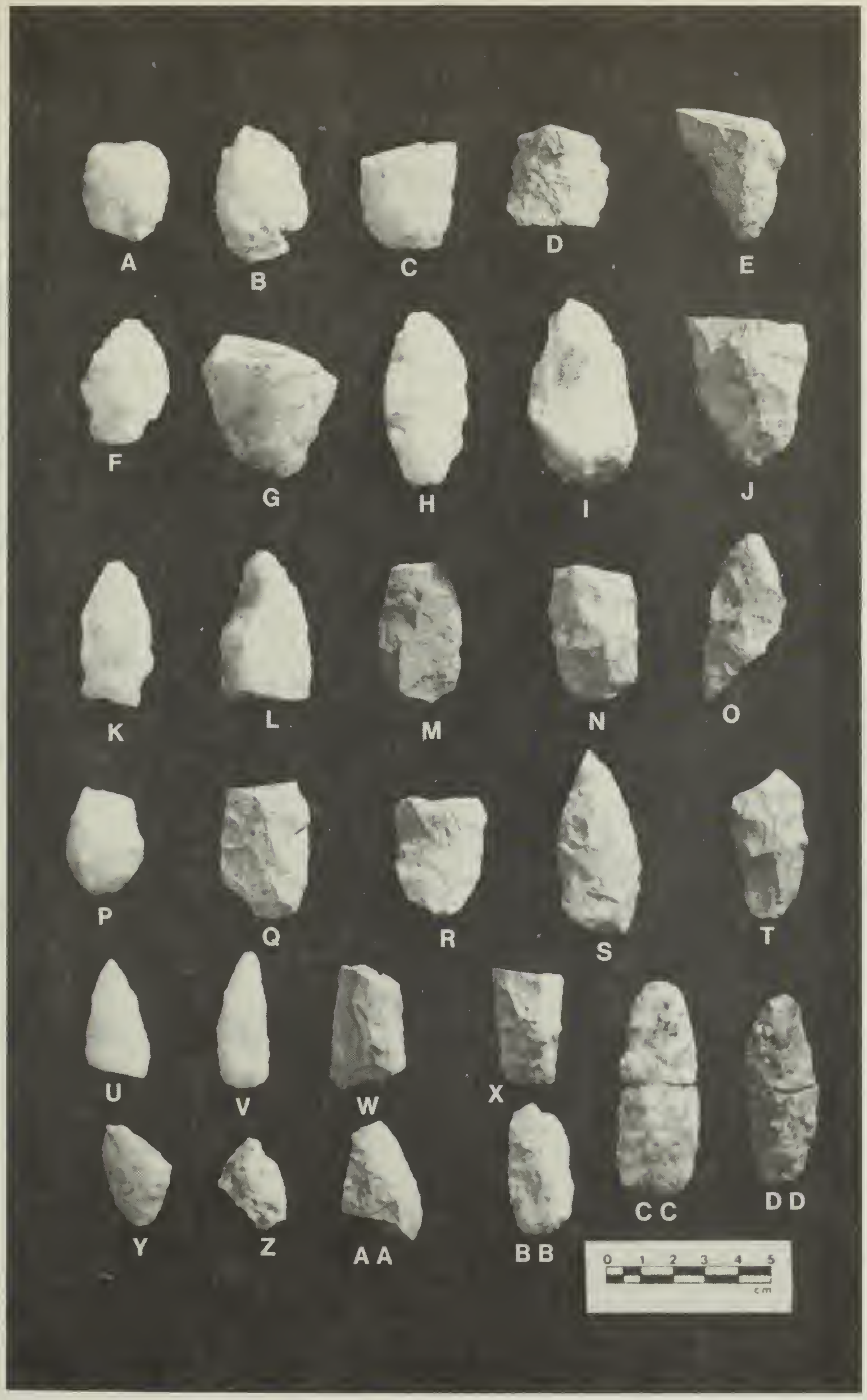


FIGURE 3.2. Examples of Group 1 (lanceolate) non-stemmed bifaces. A-J, subgroup A; K-T, subgroup B; U-DD, subgroup C.

TABLE 3.1

Biface Groups and Materials

	Quartz	Felsic Volcanics	Quartzite	Total
Non-Stemmed				
Grp 1A	11	3	0	14
1B	4	5	1	10
1C	11	6	0	17
Grp 2A	3	1	0	4
2B	5	0	0	5
2C	7	0	0	7
2D	10	3	0	13
Grp 3A	7	1	0	8
3B	10	3	1	14
Misc.	3	1	0	4
Stemmed				
Grp 1	19	2	0	21
Grp 2	13	0	0	13
Misc.	2	4	0	6
Fragments				
A	11	1	0	12
B	26	5	1	32
Total	142	35	3	180

TABLE 3.2

Dimensions of Complete Group 1 (Lanceolate) Non-Stemmed Bifaces

	Length	Width	Thickness	Weight
Group 1A (n=3)				
$\bar{x}$	52.4	26.5	17.7	29.2
s	7.3	4.0	4.8	13.4
range	44.4-58.8	22.4-30.5	14.3-23.2	17.4-43.8
Group 1B (n=2)				
$\bar{x}$	51.2	24.7	12.4	13.2
s	7.7	1.4	1.2	0.7
range	45.8-56.7	23.7-25.7	11.5-13.2	12.6-13.7
Group 1C (n=4)				
$\bar{x}$	51.2	21.4	10.6	12.3
s	11.9	3.7	1.1	6.4
range	40.2-64.8	16.6-25.4	8.9-11.3	5.9-19.9

Edges are regular. Both primary and smaller, shallower secondary flake scars are present.

Group 2: Leaf Bifaces

Number:29 Tables:3.1, 3.3 Figures:3.1, 3.3

These bifaces are broad and well-thinned. Proximal ends are rounded, and the maximum width tends to occur on the proximal half of the biface. Typically, blade edges are excurvate and intersect at the distal end at a less acute angle than those of Group 1.

Group 2A. Examples in this sample are too fragmentary to permit an accurate description of plans. Cross-sections are thick, and all four examples have fairly regular sections. Edges are somewhat wavy. Only large flake scars reaching the biface mid-line are present.

Group 2B. Plan varies from somewhat irregular to regular. Cross-sections are thinner than Group 2A, and some bifaces have unthinned lumps. Size range of this group appears to be great, based on the largely fragmentary examples. Generally, edges are regular. Bifaces are shaped primarily by large flake scars reaching the mid-line.

Group 2C. Plan varies from somewhat irregular to regular. Cross-sections about as thick as Group 2B, and some bifaces have unthinned lumps. Size range is smaller than 2B. Generally, edges are regular. Smaller edge shaping flake scars are superimposed on the pattern of thinning flake scars on most bifaces; a few of the bifaces reached their present state of finish by the removal of thinning flakes alone.

Group 2D. Most examples in this sample, have regular plans. Cross-sections are thinner than 2B. Size range is somewhat smaller than 2B, and bifaces in 2D tend to be broader than those of 2C. Generally, edges are regular. Smaller, edge shaping flake scars are superimposed on the pattern of thinning flake scars on most bifaces in the sample.

Group 3: Ovate Bifaces

Number:22 Tables:3.1, 3.4 Figures:3.1, 3.4

These bifaces are approximately equidimensional in length and width. The outline plans of most examples do not allow unambiguous identification of proximal and distal ends. Edges are continuously excurvate.

Group 3A. Plan is irregular, and edges are wavy. Cortex is present on at least one face of seven of the eight examples in

TABLE 3.3

Dimensions of Complete Group 2
Non-Stemmed Bifaces

	Length	Width	Thickness	Weight
Group 2C (n=4)				
$\bar{x}$	47.5	27.6	13.2	17.3
s	2.8	2.5	1.5	3.0
range	45-51.3	24-29.6	11.8-14.8	13.6-20.1
Group 2D (n=7)				
$\bar{x}$	55.0	32.9	11.9	19.2
s	5.6	3.0	1.5	6.9
range	48.8-63.3	28.8-37.8	10.3-14.8	8.5-30.8

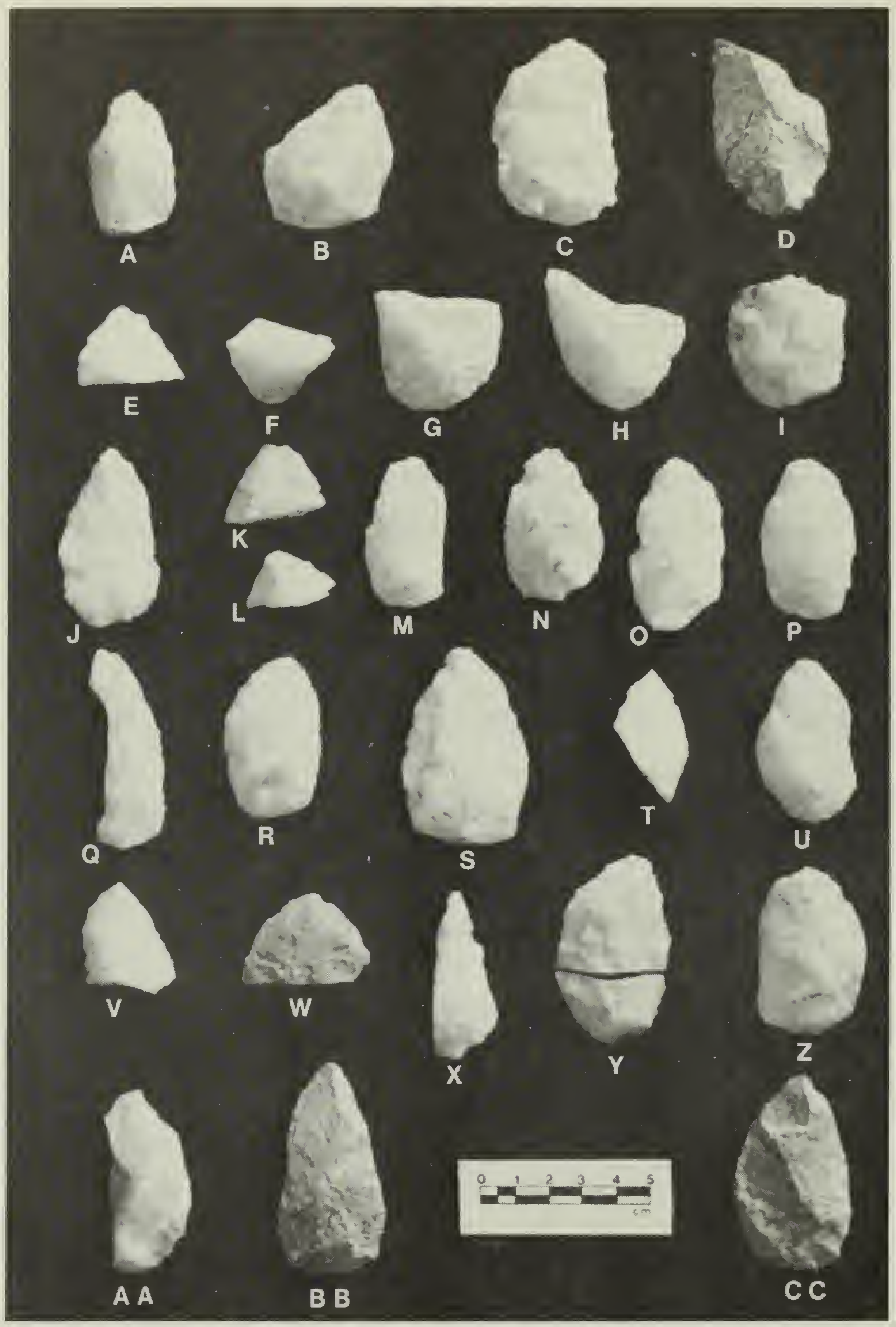


FIGURE 3.3. Group 2 (leaf) non-stemmed bifaces. A-D, subgroup A; E-I, subgroup B; J-P, subgroup C; Q-CC, subgroup D.

TABLE 3.4

Dimensions of Complete Group 3 (Ovoid)
Non-Stemmed Bifaces

	Length	Width	Thickness	Weight
Group 3A (n=2)				
$\bar{x}$	64.6	48.8	25.2	90.3
s	9.7	13.8	9.8	59.6
range	57.8-71.5	39-58.5	18.3-32.2	48.1-132.4
Group 3B (n=3)				
$\bar{x}$	38.5	32.7	15.0	18.5
s	7.5	10.6	5.7	14.1
range	30.5-45.4	20.8-41.2	9.6-21.0	5.8-33.6

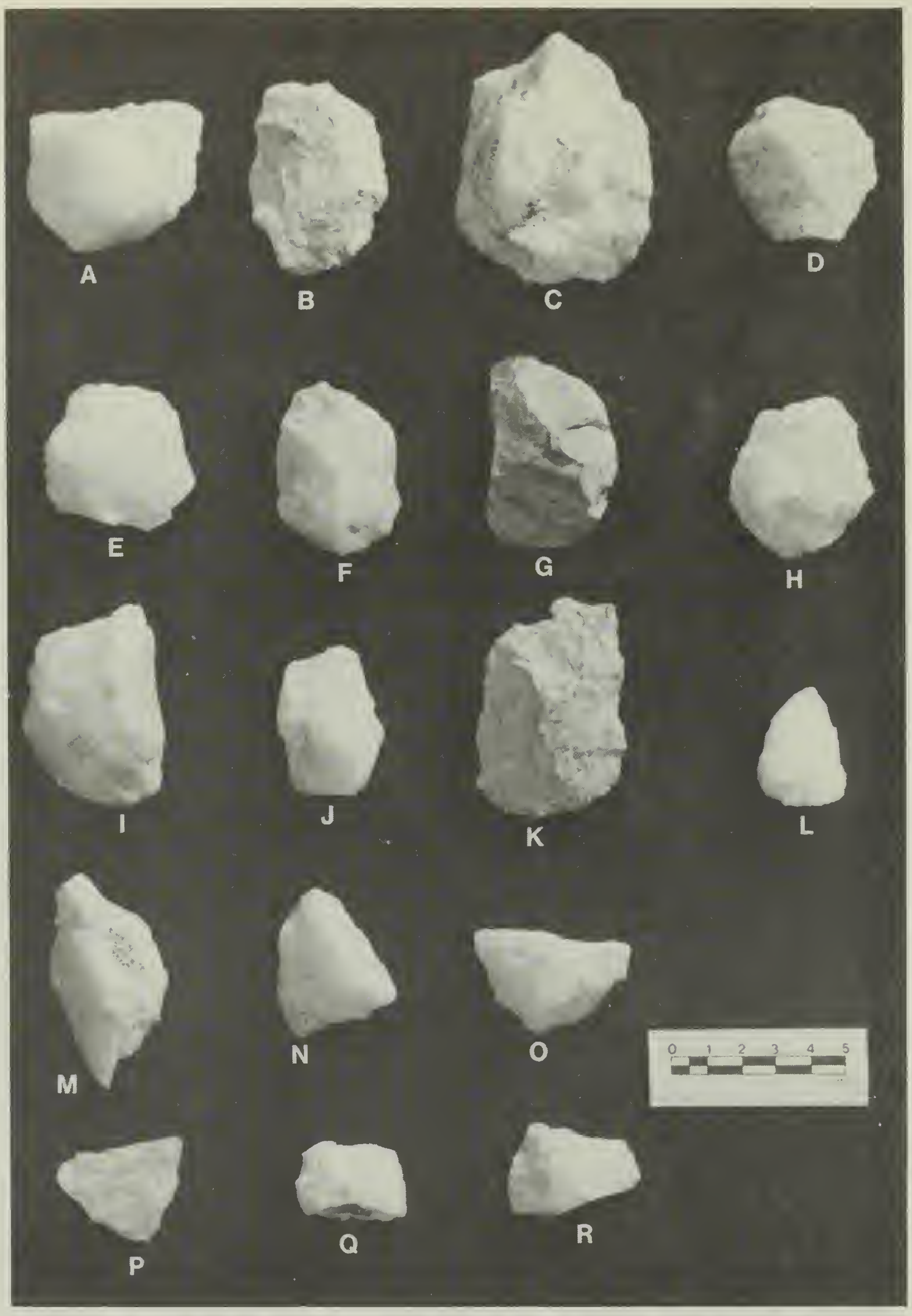


FIGURE 3.4. Group 3 (ovate) and miscellaneous non-stemmed bifaces. A-D, examples of group 3A; E-H examples of Group 3B; I-L, miscellanious non-stemmed bifaces; M-O, examples of subgroup A biface fragments; P-R, examples of subgroup B biface fragments.

this subgroup. Cross-sections are thick, and the bifaces are large. Only large flake scars reaching the mid-line, or near the mid-line, are present.

<u>Group 3B</u>. Plan is irregular to somewhat regular. Cross-sections somewhat thinner than Group 3A, and unthinned lumps are present on some specimens. Bifaces in this subgroup cover a broad range of sizes. Edges are wavy or regular, and in general the bifaces are shaped only by large flake scars.

Miscellaneous Non-stemmed Bifaces

Number:4 Table:3.1 Figures:3.1, 3.4

The 1983 excavations produced two rectanguloid bifaces (Specimens 16350 and 16408). Both have somewhat irregular plans and wavy edges. Each was shaped by the removal of large flakes that extend to the mid-line. The technological characteristics of these two specimens are equivalent to the A subgroups of non-stemmmed biface Groups 1-3. Specimen 16350 is a thick, complete biface made of quartz. Specimen 16408 is a fragmentary biface made of red-purple felsite; it is the larger and better thinned of the two.

The 1983 assemblage also includes one marginal biface (Specimen 16201), a quartz pebble that has been modified by bifacial flaking. The edge is irregular and wavy. Large flake scars extend more than halfway across the two faces of the pebble, terminating near a cortex-covered facet that is roughly perpendicular to the modified faces. The technological characteristics of this specimen is equivalent to the A subgroups of Groups 1-3.

Stemmed Bifaces

Group 1: Cape Stemmed

Number:21 Tables:3.1, 3.5 Figures 3.5, 3.6

Bifaces in this group have weakly defined, round shoulders, slightly contracting or slightly expanding stems, and expanded bases (frequently with tangs in the sense of Ritchie [1971: Figure 1]). The bifaces are biplano or asymmetrically biconvex (each 4 of 9) in longitudinal section. Most commonly, bases are subconvex (13 of 21). Stem proportions help differentiate Group 1 stemmed bifaces from Group 2 stemmed bifaces (Figure 3.6). The shoulder width/base width ratio ranges from 0.92 to 1.24 (n=11); 46% (5) have ratios less than 1.0 (base wider than shoulders) and 54% have ratios equal to or greater than 1.0 (shoulders equal to or wider than base). The shoulder height/shoulder width ratio

TABLE 3.5

Dimensions of Group 1 (Cape) Stemmed Bifaces

	n	x	s	range	median
Max L	7*	41.3	11.7	30-65.4	37.3
Max W	7*	23.6	3.5	19.6-30.2	23.3
Max Thick	7*	10.4	2.1	8.4-14.6	9.9
Shoulder Ht	13	23.4	7.0	16-42	21.0
Shoulder W	12	23.2	3.1	19.2-30.2	22.9
Base W	19	22.3	2.1	18.7-25.2	22.0
Wt	7*	12.12	8.27	7.53-30.46	8.61

*Complete bifaces only.

TABLE 3.6

Dimensions of Group 2 (Wading River) Stemmed Bifaces

	n	x	s	range	median
Max L	7*	37.1	5.8	28.9-45	36.0
Max W	7*	18.2	0.9	17.3-19.5	18.1
Max T	7*	7.6	1.3	6.5-9.8	7.2
Shoulder Ht	12	13.5	2.3	10-18	14.0
Shoulder W	11	17.6	1.1	15.3-18.9	17.4
Base W	12	12.8	1.2	11.1-14.7	12.4
Wt	7*	5.00	1.52	3.52-7.45	4.42

*Complete bifaces only.

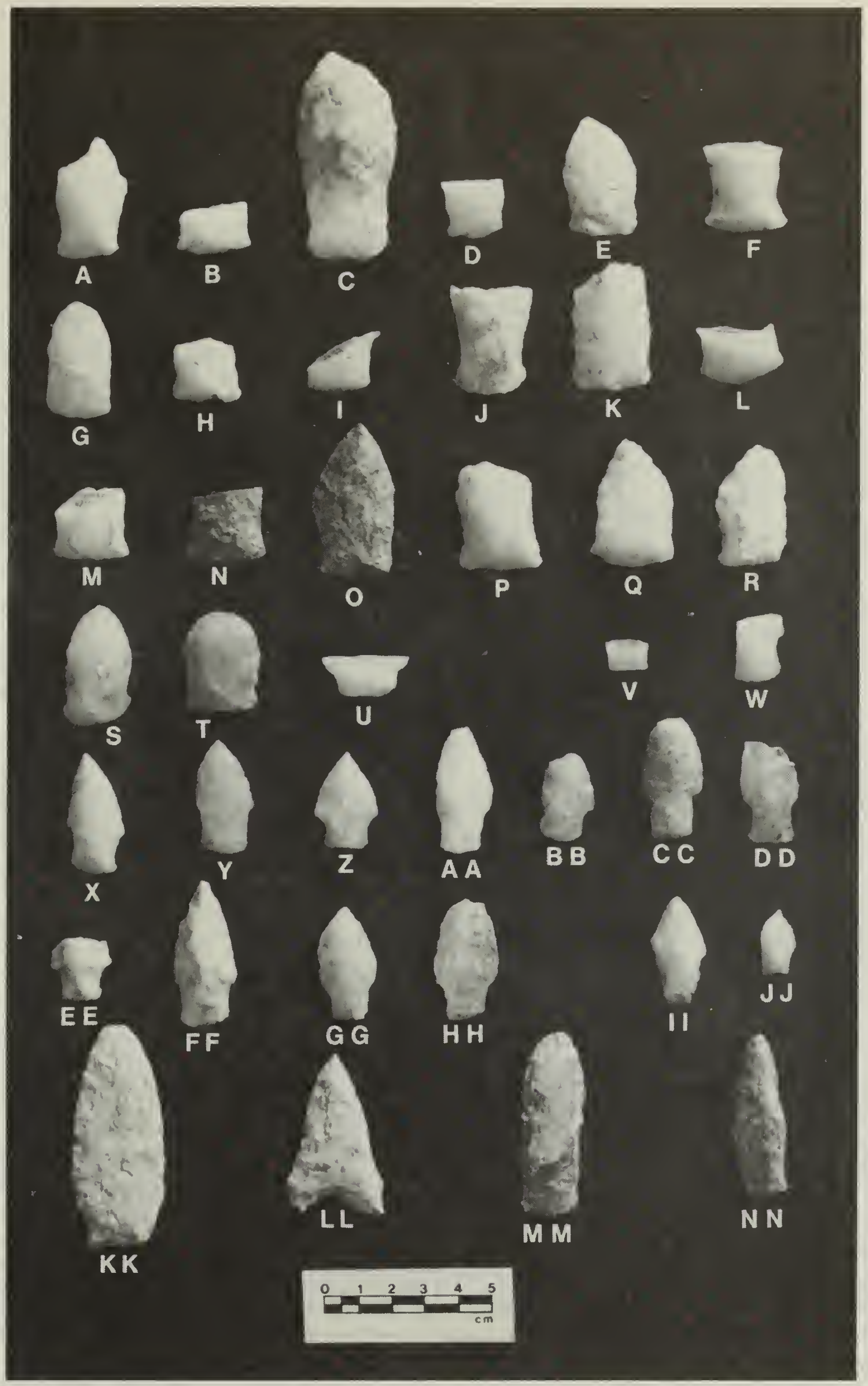


FIGURE 3.5. Stemmed bifaces. A-U, Group 1 (Cape Stemmed); V-HH, Group 2 (Wading River); II-JJ, Group 3 (Squibnocket Stemmed); KK-NN, miscellaneous stemmed bifaces.

ranges from 0.86 to 1.39 (n=11); 46% (5) have ratios less than 1.0 (stems longer than they are wide) and 54% have ratios greater than 1.0 (stems wider than they are long). The stem inflection is usually located closer to the base than to the shoulders (stem height/shoulder height ranges from 0.19 to 1.0 (n=13); four are greater than 0.5). Typically, blades are biconvex (9 of 12) in transverse section and ovate (4 of 7) in plan. Blades are usually short and asymmetrical, probably because they have been resharpened. The Cape Stemmed bifaces have the broadest stems, thickest transverse sections, greatest weight of any group of stemmed bifaces at 19BN281.

Stemmed bifaces of this form comprise an obvious and widely distributed form within the Cape Cod National Seashore survey collection as a whole. They first came to the authors attention as he was preparing the chronological overview, based on the 1979-1981 data (Borstel 1984b). Stemmed bifaces similar to Group 1 appear in illustrations of several reports (e.g., Moffett 1957:Plate 4,-Nos. 33-35, Plate 5,-No 46, 1959:Plate 1:53; Ritchie 1969b:Plate 41,-No. 20), but no one seems to have described them as a distinct group or type (e.g., they are included under the miscellaneous category of Borstel [1984b:Table 8.4]). However, T. Mahlstedt (personal communication 1984 and 1985) of the Massachusetts Historical Commission has noted that they occur in a number of collections from Cape Cod and adjacent coastal areas, and he proposes to call such bifaces Cape Stemmed projectile points. That name is employed here because the form is not limited in distribution to the High Head area.

<u>Group 2: Wading River Stemmed</u>

Number:13 Tables:3.1, 3.6, 3.7 Figures 3.5, 3.6

Bifaces in this group have weak to moderately well-defined, rounded shoulders, straight or slightly expanding stems, and bases that are narrower than the shoulders. The most common longitudinal section is asymmetrically biconvex (4 of 9). Bases are straight (6), subconvex (6), or trivectoral (similar to subconvex) (1). Stem proportions help differentiate Group 2 stemmed bifaces from Group 1 stemmed bifaces (Figure 3.6). The shoulder width/base width ratio ranges from 1.20 to 1.62 (shoulders wider than bases) (n=11). The shoulder height/shoulder width ratio ranges from .53 to 1.06 (n=11), so stems are most often (with one exception in this sample) longer than they are wide. The stem inflection is located more than halfway between the base and the shoulders (range for stem height/shoulder height is 0.50 to 0.90 (n=12). Typically, blades are biconvex in transverse section (7 of 10) and ovate in plan (5 of 9). Group 2 stemmed bifaces are smaller, thinner, and lighter than those of Group 1. In contrast to the Cape Stemmed bifaces, the Wading River group shows little evidence of resharpening.

The Group 2 stemmed bifaces from 19BN281 fit well within the range of forms and dimensions that Ritchie (1969b:241-242) describes for the Wading River projectile point type on Martha's Vineyard. Ritchie (1969b:241) considers this style to be closely associated with the Squibnocket complex on Martha's Vineyard and with the coeval Sylvan Lake complex in New York, both of which date to the centuries before 4000 BP.

The Massachusetts Historical Commission's prehistoric survey team takes a different approach to classifying small stemmed points. Their typology subdivides these bifaces into four groups on the basis of stem and base attributes (Johnson and Malhstedt 1984:25-26, 86-95), and they assign a long age range (ca. 6000-2300 BP: Middle Archaic-Early Woodland) to the forms. For cross-reference purposes, stemmed biface Groups 2 and 3 have been classified according to this system, and the assignments of individual bifaces is recorded in Appendix 4. Table 3.7 summarizes some metric attributes for the bifaces classified in this fashion.

<u>Group 3: Squibnocket Stemmed</u>

Number:2   Tables 3.1, 3.7, 3.8   Figures 3.5, 3.6

Bifaces in this group have weakly defined, round shoulders and narrow, tapering stems. The 1983 excavations produced only two specimens, so they are described individually. Specimen 16175 is asymmetrically biconvex in longitudinal section. It has a narrow, straight base. The blade is triangular in plan and biconvex in transverse section. Specimen 16192 is an unusually small (length 20 mm) biface, which is asymmetrically concavo-convex in longitudinal section. The base is subconvex and unthinned (may have been finished by snapping or may be striking platform of flake blank). The blade is excurvate in plan and biconvex in transverse section.

Both of these artifacts seem to fit Ritchie's (1969b:243) description of the Squibnocket Stemmed form, but Specimen 16187 may be at the edge of the range for the type (it is classified as a Squibnocket partly on comparison with Ritchie [1969b:Plate 12, Figure 16]). Ritchie associates Squibnocket Stemmed points with the Squibnocket complex on Martha's Vineyard. For cross-reference purposes these two artifacts are also classified according to the Massachusetts Historical Commission's (Johnson and Mahlstedt 1984:86-95) small stemmed point groups (Appendix 4 and Table 3.7).

TABLE 3.7

Dimensions of Group 3 and Miscellaneous Small Stemmed Bifaces

Cat. No.	Description	Max L	Max W	Max T	Wt
16175	Squib. St.	32.5	16.2	8.6	3.86
16187	Squib. St.	20.0	10.7	4.6	0.95
16176	Well-thinned lanceolate	67.3	28.3	7.7	17.42
16284	Large Archaic? triangle	48.5	~31	6.6	8.22
16390	Eared lanceolate	54.9	18.6	11.0	10.86
16449	Contracting stem weak shoulders	~50.0	15.8	8.6	6.36

TABLE 3.8

Dimensions of Stemmed Bifaces Cross-Classified as Small Stemmed Points

Small Stemmed I

	Max L	Max W	Max T	Sh W	Sh Ht
x	38.0	15.3	7.3	15.0	17.3
s	-	3.5	0.3	-	-
range	-	12.8-17.8	7.1-7.5	-	-
n	1	2	2	1	1

Small Stemmed II

	Max L	Max W	Max T	Sh W	Sh Ht
x	36.4	18.3	7.6	13.0	17.9
s	7.0	1.1	0.9	3.5	1.2
range	28.9-45.0	17.3-19.5	6.7-8.9	10.0-18.0	16.9-18.9
n	4	4	4	4	4

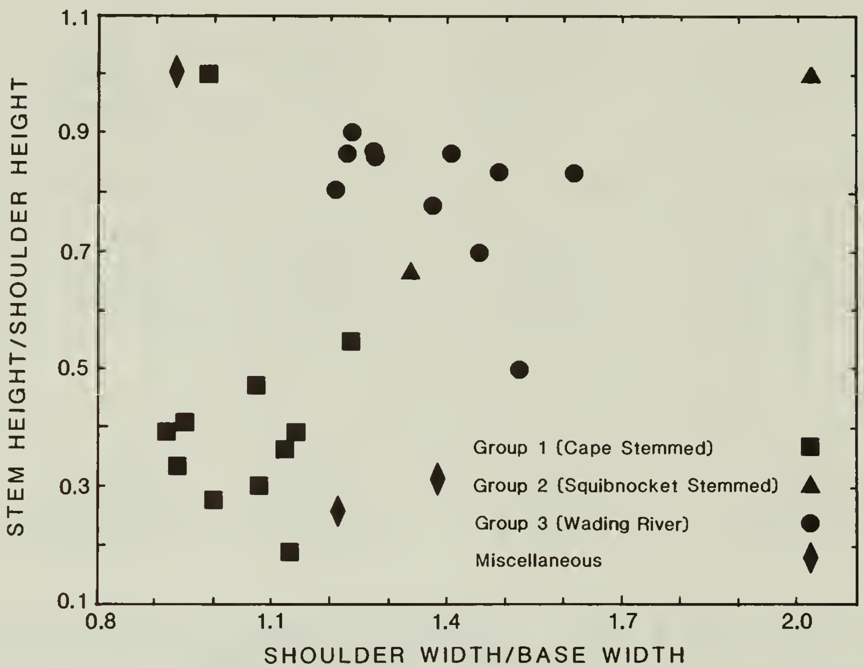
Small Stemmed III

	Max L	Max W	Max T	Sh W	Sh Ht
x	35.2	17.5	6.9	13.3	17.1
s	1.2	0.9	0.8	1.9	1.2
range	34.3-36.0	16-18.3	5.9-7.8	10.0-15.0	15.3-18.3
n	2	5	5	6	5

Small Stemmed IV

	Max L	Max W	Max T	Sh W	Sh Ht
x	38.1	17.6	9.2	16.5	17.4
s	7.9	2.0	0.8	2.1	1.8
range	32.5-43.7	16.2-19	8.6-9.8	15.0-18.0	16.2-18.7
n	2	2	2	2	2

Note: Included are Group 2 and 3 stemmed bifaces classified according to the criteria of Johnson and Mahlstedt (1984:86-95).



Proportions of Biface Stems

FIGURE 3.6

Miscellaneous Stemmed Bifaces

Number:4 Tables:3.1, 3.7, 3.8 Figures:3.5, 3.6

Four bifaces recovered in the 1983 excavations cannot be placed into any of the three stemmed groups, nor do any of them form with material earlier excavated from the site, additional groups.

Specimen 16176 is a large lanceolate stemmed biface found in 2011-00-010. The blade is ovate in plan, terminating in a rounded tip. The biface has low, round shoulders and a slightly expanding stem. A small portion of the stem is missing, but the base is clearly subconcave. The longitudinal section is biplano; the transverse section of the blade is plano-convex. Specimen 16176 is made of fine-grained felsic volcanic rock that has weathered to pale yellow, but weathering has not proceeded to the point where the surface of the rock is soft and chalky. The flake arrises on the surface and the biface edges are rounded by some form of abrasion, such as water rolling wind polishing, or buffing against leather.

Specimen 16284 is a large triangular biface from 215-00-015. The biface possesses stem-like and shoulder-like elements. The proximal 10 mm of the lateral edges diverge, and the blade edges begin to converge toward the tip, distal of sharply defined, oblique angle "shoulders." The blade is excurvate-incurvate (recurved) and may well be resharpened; serrations are absent. In transverse section the blade is biconvex, and the biface has a biplano longitudinal section. The base is distinctive; it is convex, with a deeper convexity of smaller radius superimposed at the midline. The deeper convexity is the product of the removal from both faces of basal thinning flakes; the scars of the thinning flakes extend about 10 mm from the base. Specimen 16284 is made of a fine-grained felsic volcanic rock that has weathered to pale yellow. The rock surface is generally undeteriorated, and the biface's edges and flake arrises are crisp. Although the biface is within the size range of Late Woodland Levanna triangles (Ritchie 1971:31-32; Johnson and Mahlsted 1984:130-131), the specimen is not a Levanna triangle. It differs from the Levanna type by having the stem-like and shoulder-like elements, in the more acute angle between the tip and the lateral ends of the base, and in the mode of basal thinning.

Specimen 16390 (from 2254-00-015) is a narrow lanceolate biface with small basal tangs (ears). The blade is parallel-ovate in plan and plano-triangular in transverse section. The biface is asymmetrically concavo-convex in longitudinal section, and one face has a large, thick lump covered by cortex. Although the overall form of the biface is well defined and the edges are regular, the lack of thinning gives the biface an unfinished appearance. The base is

subconvex. The specimen is made of banded rhyolite (a fine-grained felsic volcanic).

Specimen 16449 (from 233-00-010) is a narrow stemmed biface with weakly-defined, round shoulders and a contracting stem. The stem expands slightly at the base. The base is partially missing, so its plan cannot be determined. The overall plan of the blade is ovate, but one edge is recurved. The blade transverse section is thick and asymmetrically bitriangular. Specimen 16449 is made of banded rhyolite (a fine-grained felsic volcanic rock).

Biface Fragments

Number:44 Tables:3.1, 3.9

Forty-four specimens are too fragmentary to classify into one of the stemmed or non-stemmed biface groups. Included among these fragments are pieces of non-stemmed bifaces and probably portions of stemmed bifaces, distal of the shoulders. Attempts to refit fragments have been largely unsuccessful. For descriptive purposes the fragments are sorted into portion and stage categories (Table 3.9).

Distal fragments include those pieces with edges converging at a sharply defined point; these are assumed to be distal fragments because no bipointed or barbed bifaces occur in the 19BN281 assemblage. Proximal fragments have lateral edges and a squared or rounded base; all recognizable stemmed proximal fragments are included in the descriptions of the stemmed bifaces. Lateral and medial fragments have one or both edges (respectively), but the edges do not converge on the fragment or intersect the base.

The fragments are sorted into two stage subgroups. Most of these fragments could not be placed in finer subdivisions. Subgroup A fragments are thick, have large (only) flake scars, and have sinuous edges; this category is equivalent to the A subgroups of non-stemmed biface Groups 1-3. Subgroup B fragments are thinner, have large and small flake scars, and have regular edges; this category includes fragments that would be classified in the B, C, or D subgroups of the non-stemmed biface groups.

TABLE 3.9

Biface Fragments

Subgroup	Proximal	Distal	Medial	Laterial	Total
A	0	3	9	0	12
B	6	11	15	0	32
Total	6	14	24	0	44

TABLE 3.10

Retouched Flake and Uniface Dimensions

Specimen No.	Provenience	Tech Type	Material	Wt. (g)
16212	206-00-015	Ret Fl	Qtz	4.60
16274	214-00-010	Ret Fl	FgFV	7.50
16278	214-00-015	Ret Fl	WeF	9.77
16430	229-00-020	Uni	FgFV	12.85
16436	231-00-000	Ret Fl	Qtz	7.88

Specimen No.	L mm	W mm	T mm	Location of Retouch	Span	Edge
16212	24.5	24.5	7.0	proximal	24.8	75°
16274	24.8	-	7.1	proximal distal	42 37	55° 45°
16278	-	-	-	lateral	39	35°
16430	-	-	-	lateral	53.5	40°
16436	>32	23.1	10.4	lateral	26.4	65°

Key: Ret Fl. -Retouched Flake; Uni -Uniface; Qtz -Quartz; FgFv -Fine gravel felsic volcanic; WeF -Weathered Felsic Volcanic.

Uniface and Retouched Flakes

Number:5 Table:3.9 Figure:3.4

Four retouched flakes and one uniface were recovered during the 1983 excavations. Both technology types have systematic, regular edge modification, but the flake scars on the retouched flakes extend less than half the distance to the longitudinal axis of the flake. Specimen 16278 should be regarded as a possible retouched flake, because the edge and surface morphology are obscured as a result of weathering. All of the retouched flakes are unifacially modified, and their edges are sinuous; overall, their plans are varied. The uniface and the retouched flakes are all modified on the dorsal surfaces of the flake blanks. Steep edge angles suggest scraping was the primary function of most of these tools.

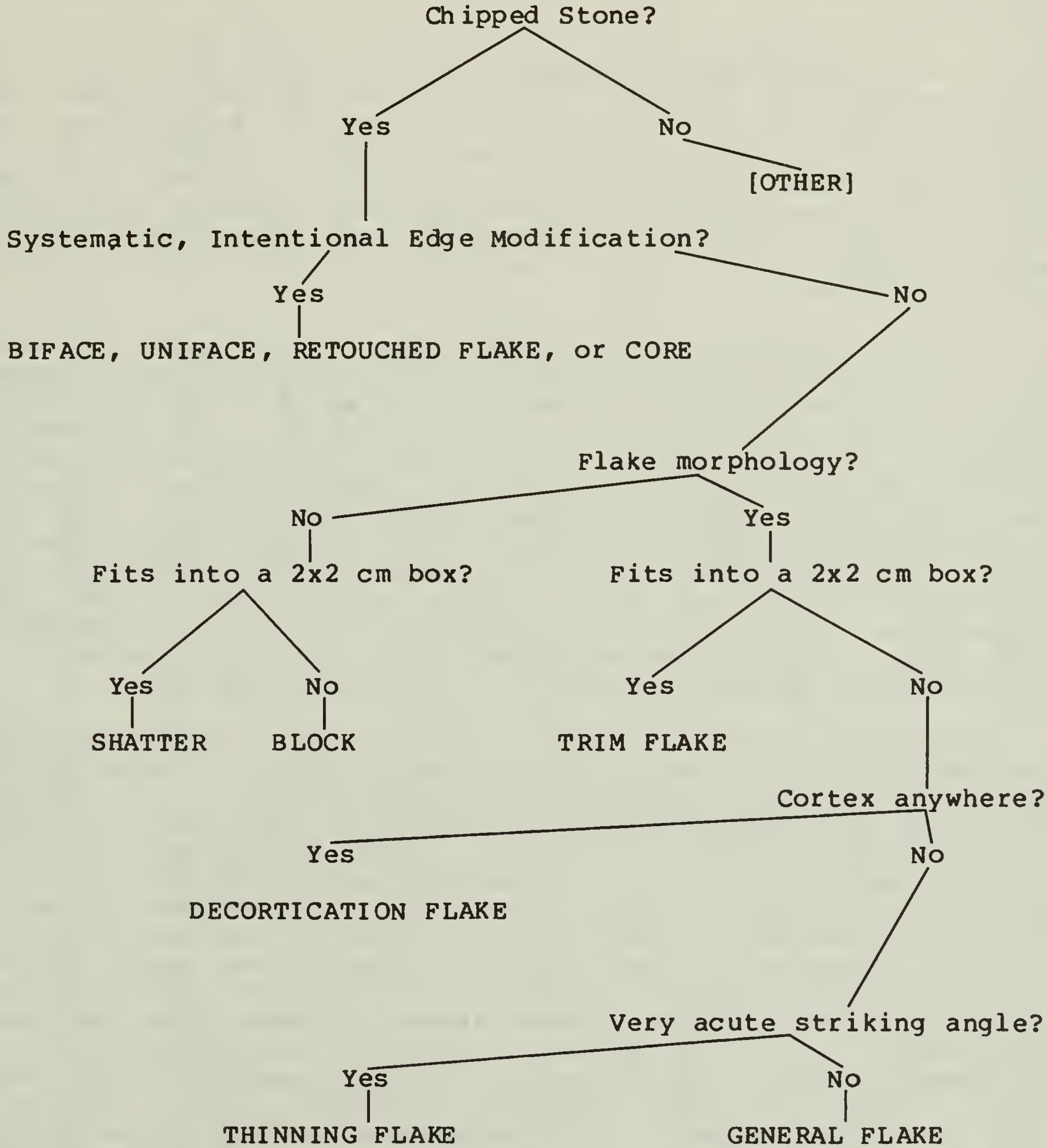
Cores

No cores have been noted in the 1983 assemblage. This absence is probably due both to raw material characteristics (quartz pebbles tend to be small) and to the rare use of prepared cores for flake production. A few artifacts in the block category might alternatively be classified as cores (some of the worked pebbles) or core fragments.

Flakes and Blocks

Number:15714 Table:3.11

Flakes and related debitage make up the bulk of the lithic assemblage from the 1983 excavations, and for the site as a whole. This material is classified into six categories in the survey's cataloging system (McManamon 1984d:Table 9.9). Two general comments about the classification are in order. First, the classification is a taxonomy in the sense of Dunnell (1971:76-84) (Figure 3.7). The categories are hierarchical, so some artifacts placed in one category may also have attributes of another category. Second, in contrast to McManamon (1982:7-8; 1984d: 25-27, 32), the author takes an even less restrictive view of the relationship between some of the technological categories and the stages of tool manufacture they indicate. This point of view reflects a detailed examination of the 19BN281 lithic assemblage --something that has not been previously undertaken for the park survey collections. The following comments apply



The attributes used to distinguish among bifaces, unifaces, retouched flakes, and cores are not shown. Some categories have additional, secondary criteria (see McManamon 1984d:Table 9.9); however, the questions in this key are the critical characteristics for distinguishing the types.

Figure 3.7: Partial Dichotomous Key for Technology Classification.

only to 19BN281, since other assemblages have not been examined as closely.

Among artifacts without intentional, systematic edge modification, the taxonomy distinguishes between flakes and blocks. Flakes have morphological elements that allow the cataloger to distinguish dorsal and ventral surfaces and to orient the flake relative to the direction of the force that detatched it (see Crabtree 1972:44, 45, 48). Blocks are thick angular pieces that lack such morphology; blocks also include artifacts that are not flakes and lack systematically formed, functional edges.

Flakes are first subdivided by size. Trim flakes are those that fit within a 2 cm x 2 cm box. This is by far the largest technology type at the site, accounting for 71.1% of all lithics from the 1983 excavations. McManamon (1984d:27) regards them as indicators of "the final shaping and thinning of bifaces or unifaces and the rejuvination of tool edges blunted by use." Many trim flakes may be produced by edge shaping and tool resharpening, but they are also produced by edge preparation at other stages of manufacture. For example, in the initial phases of biface manufacture small flakes are produced when the stoneworker cleans and strengthens an edge before removing a large flake. Trim flakes may have cortex, but the frequency of this attribute among trim flakes has not been measured.

All flakes having cortex, either on the dorsal face or on the platform, are classified as decortication flakes. Seven percent of the lithics are decortication flakes. In the 19BN281 assemblage the characteristics of the cortex are similar to those of pebbles and cobbles found in the local drift and in drift derived marine deposits. In the 1983 assemblage, a minority of this type are primary decortication flakes (as defined by White 1963:5). These include both flakes with cortex-covered platforms (primary flakes in the strictest sense) and those having platforms on fresh rock. Secondary decortication flakes comprise the majority of this type. Since use wear analysis has not been undertaken, it is not possible to evaluate the applicability to the 19BN281 lithics of White's (1963:5) assertion that such flakes "were, in many instances, selected to be used as a naturally backed knife." A few decortication flakes have cortex only on the platform. Many of these, as well as a few primary and secondary flakes, have striking angles (and possibly other attributes) that would place them into the thinning flake type, were it not for the presence of cortex. As McManamon (1984d:27) notes, a majority of decortication flakes are indicators of the initial steps in stone tool making; however, some decortication flakes, especially those with cortex only on the platform or on a small section of the dorsal face may be produced fairly well along in the manufacturing process.

No thinning flakes are recorded for the 1983 assemblage. The absence of this type results from a weakness in the

Table 3.11

19BN281 EU's 194-233: Chipped Stone Technology Types and Material

	GenFlake	DecFl	ThFlk	Trim	Block	Shttr	RetFl	Unif	Biface	TOTAL
Quartz										
N	1471	1034	0	10612	216	1260	2	0	93	14738
Row%	10.0%	7.0%	0.0%	72.0%	1.5%	8.5%	.0%	0.0%	.6%	100.0%
Col%	82.4%	93.5%	0.0%	93.8%	88.2%	99.4%	50.0%	0.0%	76.9%	92.7%
FelVols										
N	300	53	0	670	24	8	2	1	27	1094
Row%	27.4%	4.8%	0.0%	61.2%	2.2%	.7%	.2%	.1%	2.5%	100.0%
Col%	16.8%	4.8%	0.0%	5.9%	9.8%	.6%	50.0%	100.0%	22.3%	6.9%
Qtzite										
N	10	17	0	17	5	0	0	0	1	52
Row%	19.2%	32.7%	0.0%	32.7%	9.6%	0.0%	0.0%	0.0%	1.9%	100.0%
Col%	.6%	1.5%	0.0%	.2%	2.0%	0.0%	0.0%	0.0%	.8%	.3%
Other										
N	4	2	0	11	0	0	0	0	0	18
Row%	22.2%	11.1%	0.0%	61.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Col%	.2%	.2%	0.0%	.1%	0.0%	0.0%	0.0%	0.0%	0.0%	.1%
TOTAL										
N	1785	1106	0	11310	245	1268	4	1	121	15902
Row%	11.2%	7.0%	0.0%	71.1%	1.5%	8.0%	.0%	.0%	.8%	100.0%
Col%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes: Totals for bifaces differ by from counts in Table 3.1 because 3 specimens are composed of refitted fragments. GenFlake --general flake; DecFl --decortication flake; ThFlk --thinning flake; Shttr --shatter; RetFl -retouched flake; Unif --uniface; FelVols --felsic volcanic rock; Qtzite --quartzite.

cataloging system and does not indicate that no biface shaping took place at the site. The cataloging system failed to identify such flakes for at least two reasons: first, some thinning flakes are also decortication flakes, and decortication flakes take precedence; second, the definition of thinning flakes (McManamon 1984d:Table 9.9) is difficult to apply without measuring flakes individually. The survey cataloging system probably under-represents flakes produced by bifacial thinning of rocks of all materials.

Flakes that are greater than 2 cm in maximum dimension and that lack cortex or very acute striking angles are the second most common technology type, accounting for 11.2% of all lithics. McManamon (1984d:Table 9.9 and 27) calls these "regular flakes", but this study uses the term "general flakes." This type includes some flakes produced by bifacial thinning. It may also include flake blanks --pieces intended for shaping into tools. Since most general flakes are under 6 cm in length (bifaces are generally larger) and formed unifaces, such as scrapers, are rare, the number of flake blanks is probably quite small. Use wear study has not been undertaken, so the frequency with which the Late Archaic people at 19BN281 used flakes as casual tools is unknown. The diversity of sizes, proportions, and other attributes of individual specimens in the general flake type makes the author hesitant to regard them as indicative of any one part of the manufacturing process (cf. McManamon 1984d:27).

Blocks are angular pieces that do not fit into a 2 cm x 2 cm square; smaller angular pieces lacking flake attributes are termed shatter. Shatter is the third most common lithic type in the 1983 assemblage (8.0%), and blocks rank fifth in abundance (1.5%). Both McManamon (1984d:40) and Borstel (1984c:322) have observed that of all materials used for chipped stone tools on outer Cape Cod, quartz has the tendency to produce the highest proportion of blocky debitage.

The technological type, block, includes several kinds of material. Most common are those artifacts that fit the category definition closely. Blocks are multifaceted, and the facets are commonly formed by segments of large flake scars. In other classification schemes (e.g., White 1963: 6), some of these pieces might be classified as core nuclei (exhausted cores). A minority of blocks have smaller or larger patches of cortex. The block category also includes a quantity of specimens best described as worked pebbles. Worked pebbles in the assemblage include the following: large fragments of pebbles with limited modification of the fracture surface(s); pebbles having one to a few flake scars on one or more faces; and pebbles that have been flaked so that all or most cortex has been removed from one face. Some of these are clearly bifaces in the earliest stages of reduction; others may be stones that were tested and rejected as potential tool blanks. A few artifacts in the block category are pieces that may be bifaces, but because of plan or thick cross-section do not have functional edges; these seem almost to

be analogous to pieces of wood that are idly whittled until hardly anything remains. Finally, a few artifacts have been classified as blocks which on re-examination could more properly have been included within the general flake or decortication flake types. (Since only a small portion of the assemblage has been re-examined in detail, these are left in the block category.) These pieces are thicker and larger than the majority of specimens in the two types. In sum, many, but by no means all, blocks are products of early phases of tool-making. Similarly, shatter represents a wide range of manufacturing steps, because the inhomogeneity and unpredictability of quartz could yield small, blocky debitage at almost any stage.

These comments on block and shatter parallel McManamon's (1984d:27) statement that "large grain raw materials, such as quartz, are likely to have produced blocks and shatter at all manufacturing stages and for rejuvenation as well." However, examination of the assemblage excavated in 1983 does not support his suggestion that at 19BN281 the percentages of quartz shatter and block primarily indicate "late stage manufacturing and tool maintenance rather than primary manufacturing" (McManamon 1984d:40). McManamon places the emphasis on late stages of manufacture because of comparisons with the Sassafras site in Rhode Island (Barber 1981). The comparison of percentages of debitage classes from these two sites is inappropriate for three reasons. First, the Sassafras site is a quarry workshop (Barber 1981:62), and not, like 19BN281, a habitation site (see McManamon 1984e:377-383). Second, Barber (1981:58) contends that the Late Archaic stoneworkers at the Sassafras site manufactured only a single style of biface, the Squibnocknet Triangle type; although the manufacture of bifaces took place at 19BN281, Squibnocket Triangles are quite rare (Borstel 1984b:Table 8.4). Finally, and most importantly, the people at the Sassafras site quarried tablets of quartz directly from bedrock (Barber 1981:56, 58). That blocky debitage forms such a large percentage of the assemblage is hardly surprising, given the characteristics of the raw material at this particular source. In contrast, the stoneworkers of 19BN281 used pebbles and cobbles; glacial quarrying and transport, followed by stream and wave rolling tend to break apart unsound rock (Borstel 1984c:299), reducing the tendency for knapping of quartz pebbles to produce blocky debitage in the quantities recorded by Barber.

There is a further, minor, complication to the interpretation of percentages of shatter and block at 19BN281. Material cataloged between 1979 and 1981 appears to have a consistently lower percentage of trim flakes and a consistently higher percentage of shatter and block than the artifacts cataloged in 1983. Of the 8552 artifacts recorded in McManamon's (1984d) Table 9.13, 52.6% (4497) are trim flakes and 23.5% (2011) are shatter and block. These percentages compare with 71.1% trim flakes and 9.5% shatter and block from the 1983 excavations (Table 3.11). The differences might indicate the 1983 excavations tested an area functionally different from the modal

TABLE 3.12

1979-1980 Excavations: Chipped Stone in Concentration 281.43

Type	n	Pct
General Flakes	97	13.7%
Decortication Flakes	59	8.3%
Thinning Flakes	1	0.1%
Trim Flakes	408	57.6%
Blocks	18	2.5%
Shatter	111	15.7%
Retouched Flakes	0	0%
Unifaces	0	0%
Bifaces	14	2.0%
Total	708	

Note: Table includes artifacts from EU's 76, 78, and 125 and ST 903. Percentage of bifaces corrected from McManamon (1984d:Table 9.13).

use of the site. Contradicting this suggestion are similarities between the older and more recent excavations in the percentages of other technology categories; for example, decortication flakes comprise 8.1% (693) of the 1979-1980 lithic assemblage, as compared to 7.0% for the 1983 material, and general flakes comprise 14.6% (1247) of the 1979-1980 assemblage, as compared to 11.2% for the 1983 excavations. Further support for the notion that the differences are not inherent in the archeological record is provided by an examination of the percentages of the three excavation units (EU's 76, 78, and 125) and one shovel test (ST 903) that, along with EU's 194-233, comprise Concentration 281.43 (Table 3.12). Even though these units are located close to the 1983 excavation area, the percentages are more similar to those for the site as a whole than they are to those derived from the 1983 material. The percentages of blocks are about the same between the 1979-1980 and 1983 artifacts from Concentration 281.43. Hence, the problem appears to be largely that the catalogers of the 1983 material were able to identify flake morphology on more fragments of small debitage. These items were cataloged as trim flakes, and not shatter. A re-examination of the debitage from all seasons of excavations could establish the true source of the discrepency. The quantities of shatter and block material excavated in 1983 at 19BN281 imply that primary reduction may be far more widespread at the site than McManamon (1984d:40 and Table 9.14) proposes.

Gouge

Number:1 Table:3.13 Figure:3.8D

Specimen 16279 is a complete, small gouge from 214-00-020. In plan the tool is trianguloid with excurvate sides; the cross-section is semi-cylindrical. The implement has a short length channel that contracts toward the poll, and the channel bottom is round in cross section. The bit has a diameter of 60 mm and a cord width (span) of 25.4 mm. The poll is slightly knobbed on the dorsal side. The gouge is made of greenstone.

The asymmetry of the poll suggests that the gouge was made on a pebble blank. The flat facet of the ventral face may be a rock clevage plane that was present as part of the pebble cortex and was not modified during manufacture. The specimen's dorsal surface and the channel distal of the bit are pecked. A portion of the poll is unmodified by pecking, and on the distal face the pecked surface gives way to a polished surface about 10 mm from the bit. On the ventral side polish fills a U-shaped area beginning at the lateral edges of the bit, reaching a maximum width of 15 mm in the middle of the channel.

Under 7-30 power magnification striations are visible in the polished areas. The location, form, and orientation suggest that

Table 3.13

Gouge Attributes

Dimensions

Maximum Length:	103.0 mm	
Maximum Width:	30.0 mm	(ca. 19mm from bit)
Thickness:	24.8 mm	(ca. 53mm from bit)

Bit width (span):	25.4 mm
Bit depth:	5 mm
Channel length:	40 mm
Channel depth at mid-length:	5.5 mm

Wt: 124.02g

Qualitative Attributes (Sanger 1973:Fig. 5 and Table 14)

Bit

Plan:	Convex-symmetrical
Convexity scale:	6
Curvature class:	C-4
Longitridunal section:	asymmetrical
Lateral section:	concavo-convex

Body

Plan:	expanding and contracting
Longitudinal section:	symmetrically plano-convex
Lateral section:	hemi-cylindrical

Poll

Plan:	rounded
Longitudinal Section:	asymmetrically rounded
Lateral Section:	hemi-cylidrical

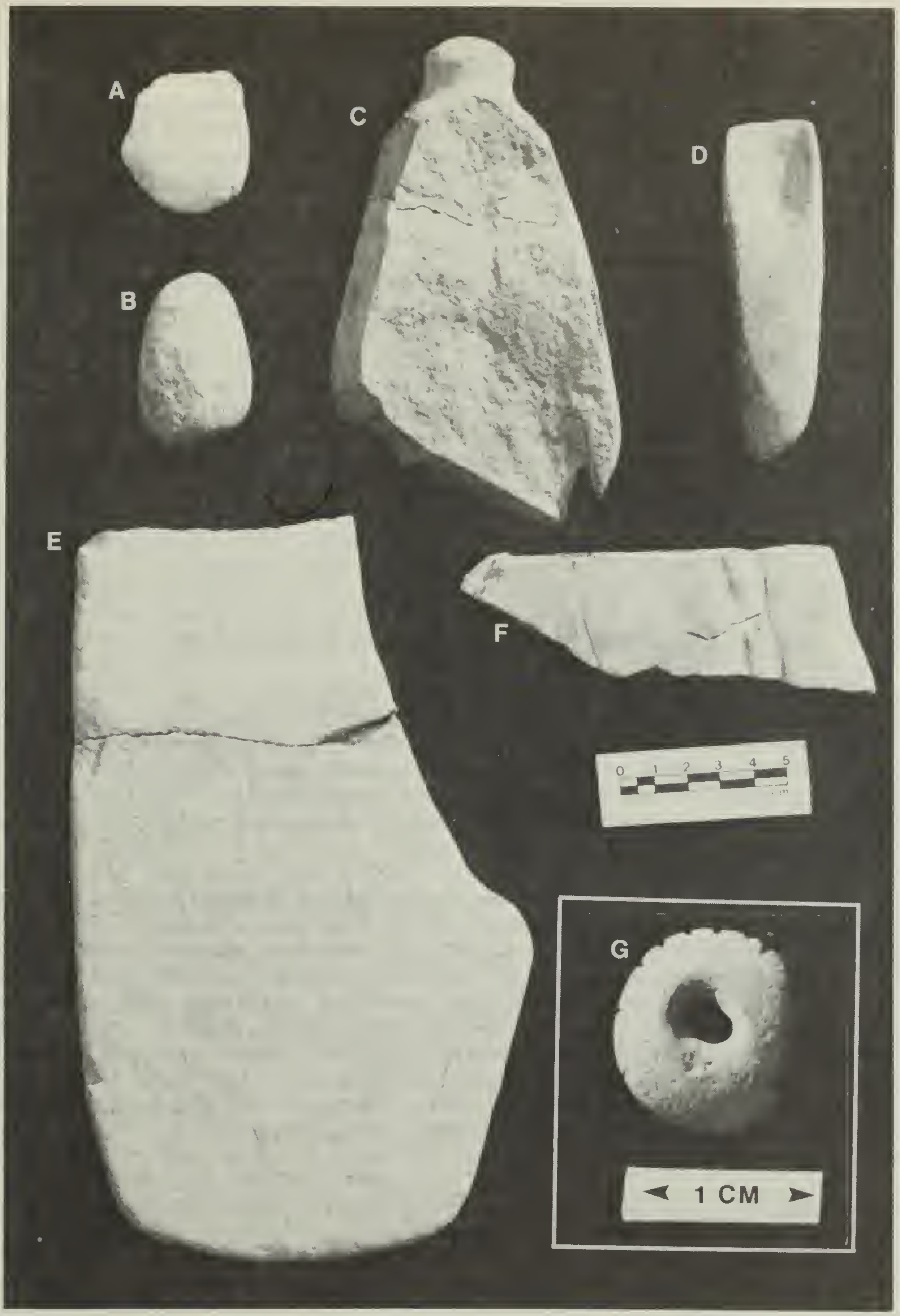


FIGURE 3.8. Ground and rough stone artifacts. A-B, hammerstones; C, plummet; D, gouge; E-F, abrasive stones; G, bead.

these were produced by grinding during the manufacture or maintenance of the tool and not during use. The bit edge appears to be in good condition. It has some weathered nicks and the curvature flattens somewhat toward the central portion of the bit. In cross-section the dorsal surface curves slightly, but no faceting is present along the bit edge.

Manufacture of the implement consisted of pecking the blank into shape, followed by grinding the bit. This may have been the entire manufacturing process, or additional steps may have been involved, for as Dickson (1981:36) points out, the late stages in the manufacture of such tools frequently obscure evidence of the earlier steps. The gouge was probably hafted (Sanger 1973:28-30,63; Dickson 1981:55-60), and it is possible that the slight swelling of the poll facilitated this. This implement preserves no evidence of how or on what materials it was used, but it is probably a woodworking tool (Sanger 1973:29,63).

Plummet

Number:1 Figure:3.8C

Specimens 16391 and 16392 are fragments of a large plummet from 225-00-015 (Quadrants 1 and 3, respectively). These fragments comprise about one-third of the body and about half the head; the remaining portions are sheared away, perhaps along rock cleavage planes. Fire-cracked rock samples from this unit and from surrounding squares were checked for additional fragments of this implement, but none were found.

The plummet is made on a trianguloid pebble of micaceous schist. It has an overall length of 145 mm, a width of 90 mm, and weighs 309.5 g. The knob has a maximum diameter of 28.3 mm, and the neck measures 27.0 mm in diameter. In Sanger's (1973: Table 20) terminology, the body base is pointed, the shoulder is rounded, and the neck is grooved. From the remaining exterior surfaces, the body and the knob appear to be unmodified pebble cortex. Only the neck has been shaped by pecking. Along the central part of the neck, the pecked surface is somewhat polished; this smoothing might be the result of a cord rubbing against the neck.

Plummets are commonly considered to be fishing weights for nets or lines, and this is a plausible, though unsubstantiated, suggestion for the function of this specimen.

Abrasive Stones

Number:2 Figure:3.8E-F

The 1983 assemblage includes two cobbles with striated surfaces. Both are well-rounded (Pryor 1971: Table 2) cobbles of quartzite. The extent of the striations is clear evidence of their repeated use for polishing or sharpening bone, stone, or wooden implements. Archeologists commonly identify such artifacts as whetstones.

Specimen 16285 is a large fragment of an abrasive stone from 215-00-015. The artifact is 222 mm x 137 mm x 14 mm and weighs 761.4 g. One end of the cobble is missing. Both faces have several patches of slight polish with broad, very shallow grooves and numerous fine striations. The shallow grooves and fine striations tend to be parallel to the long axis of the artifact. The striations end abruptly at the break, indicating that breakage occurred after the artifact was used. One face is somewhat more altered than the other, and this face has one area of striations that are oblique to the long axis. Two portions of this face also have sets of striations perpendicular to the long axis; in one instance these clearly overlie the longitudinal striations.

Specimen 16377 is a fragmentary artifact from 224-00-010. The fragment measures 125 mm x 45 mm x 11 mm and weighs 105.3 g. One face is completely covered with cortex and is marked by portions of three shallow grooves that parallel the present natural edge of the fragment. In addition to these grooves, this face also appears to have numerous fine striations roughly parallel to the grooves. Most cortex has spalled away from the reverse face, but short segments of two grooves, oblique to the natural edge, are present on the small patch of cortex that remains. The grooves are assymetrical in transverse section and irregular in longitudinal section. In plan, the smaller three grooves are more or less parallel sided. The plans of the two larger ones, both located on the cortex-covered face, are more irregular; each is intersected by one or more short grooves, oblique to the main axis and sharply V-shaped in plan. All of the grooves end abruptly at the broken edges, indicating that they were cut into the cobble before it was broken. The grooves range in width from ca. 3.5 mm to ca. 6 mm and range in depth from ca. 0.3 mm to ca. 1.5 mm.

Bead

Number:1 Figure:3.8G

Specimen 16280 is a bead made from a small pebble of dark reddish brown metamorphic mudstone. The artifact was excavated in 215-00-010. The bead measures 11.3 mm x 9.6 mm x 3.4 mm and weighs 0.48 g. An oval hole, measuring 2.7 mm x 1.7 mm, pierces the center of the bead. The hole is drilled biconically and the surface of the hole is smooth. It is unclear whether this smoothness is a product of the drilling techique or whether it is a result of the bead rubbing against a cord that might once have passed through the hole. Seventeen shallow V-shaped notches are cut into the edge of the pebble. The depth of the notches varies from ca. 0.2 mm to 0.8 mm. The notches are somewhat convex in longitudinal section. Some of the notches have multiple subparallel grooves cut into their floors or walls. These grooves are about 0.1 mm in width and run part of all of the length of the notch. The transverse and longitudinal sections, along with the presence of narrow grooves indicates that the notches were cut with a thin cord of tough, flexible material (e.g., sinew?).

Hammerstones

Number:2 Figure:3.8A-B

The two hammerstones from the excavations could have been used for several tasks, including chipped stone tool manufacturing (for which the debitage provides abundant evidence), food preparation, or pigment grinding.

Specimen 16273 (214-00-010) is a rounded (Pryor 1971: Table 2) granitic pebble measuring 53.2 mm x 35.5 mm x 28.4 mm. The pebble weighs 77.79 g. It has two crushed and battered facets that extend most of the length between the pebble's ends. Neither end, however, shows any evidence of use damage.

Specimen 16400 (226-00-020) is a battered quartz pebble. It measures 43.7 mm x 42.0 mm x 33.3 mm and weighs 73.36 g. Battering occurs on both ends (including nearby outlying protruberances) and along one edge, extending from end to end. The pebble appears to have been subrounded (Pryor 1971:Table 2) initially, but much of the cortex has been spalled off through use. Since the angles between the chipped facets are obtuse and the intervening edges are crushed, the flaking is probably the result of use as a hammerstone, and the artifact is thus classified, rather than as a battered nodule (Borstel 1982:26-37) or battered block.

Fire-Cracked Rock

Number:3783

The 1983 excavations produced a total of 123.1 kg (3783 pieces) of fire-cracked rock. Fire-cracked rocks are recognized in the field by reddish to brownish discolorations that occur on them. Fire-cracked rocks also have curved thermal fracture surfaces and typically an irregular, blocky form. Rock types include several varieties of metasedimentary and coarse-grained granitic rock, all available locally.

Ceramics

Number:14 Table:3.14

The 1983 excavations produced a total of 14 sherds (total weight: 5.98 g). Most of the sherds are tiny --all but one weighs less than 0.5 g-- and commonly they are exfoliated. Shell temper predominates, but the largest sherd, weighing 2.96 g, is grit tempered, having a fabric impressed exterior and a scraped interior (terms follow Childs 1984:158-9) (Table 3.14). The pottery is probably late Middle Woodland or Late Woodland in affiliation, and the 1983 assemblage is essentially identical to the material previously recovered from the site.

Historic Artifacts

Number:3

Historic artifacts recovered during the 1983 excavations comprise the following items:

1 machine cut ferrous metal nail from 195-00-000 (Specimen 16742);

1 fragment of ferrous metal and indeterminate form, weighing 1.46 g from 197-00-015 (Specimen 16743); actual depth of recovery was about 25 cm BS;

1 machine cut nail from 214-00-010 (Specimen 16744); actual depth of recovery was about 11 cm BI.

Both machine cut nails were too corroded to determine whether the heads were hand applied or machine formed. Machine manufacture of nails began in the 1790's; although they continue to be manufactured for special purposes today, machine cut nails were

TABLE 3.14

Ceramics

Provenience	Temper	Exterior FI	Exterior Sp	Interior Sm	Interior Sc	Interior Ind	Total	Wt (g)
196-00-015	Shell		1	1			1	0.11
197-00-015	Shell		2			2	2	0.32
199-00-015	Shell		2			2	2	0.21
202-00-005	Shell		1	1			1	0.44
207-00-005	Shell		1	1			1	0.35
210-00-015	Grit	1	1		1	1	2	3.09
220-00-000	Shell	1?	1			2	2	0.37
223-00-005	Shell		1			1	1	0.48
230-00-005	Shell		1			1	1	0.18
231-00-000	Shell		1			1	1	0.43

Key: Surface treatments. FI-fabric impressed; Sp-spalled; Sm-smoothed; Sc-scraped; Ind-indeterminate.

replaced in popularity by wire nails around 1900 (Nelson 1968:8, 10).

Faunal Material

Bone

Number:93+ Table:3.15

Faunal material from 19BN281 is sparse, probably because of poor preservation in the acidic soil of the site. All of the bone is calcined, and this may be largely responsible for the preservation of any bone at all from the site. Although the 22.2 g of bone recovered in 1983 is a minuscule amount, it substantially increases the faunal sample from the site. The excavation of this comparatively large amount of bone can be attributed to the following factors: the careful work of screeners, who had been alerted to look for bone fragments; excavation of a large volume of soil; and placement of the excavation block in an area with known potential for producing faunal material. Recovery of this quantity of faunal material at 19BN281 grew directly out of the results of the 1980 field season.

Spiess (1984) was able to make bone element and taxomonic identifications of only eight fragments (six of these from the 1983 excavations) (Table 3.15). He reports that the remainder of the faunal material is mammal bone, mostly cortical (bone surface) fragments. Five of the eight fragments are bone elements from the limbs; the remaining three include a scapula fragment, a fin ray or rib fragment, and a possible antler fragment. Taxonomically, the fragments represent a range of large and medium size mammals (including deer, beaver?, and canid(s?)) and one fish.

About all that can be inferred from this assemblage is that Late Archaic people hunted several varieties of mammals, including deer, and fished while living at the site. The material provides no insights into either season of occupation or butchering practices. It is impossible to determine whether the recovered bone represents small pieces that started out small or small sections of larger bone fragments. In either case, since all of the bone is calcined, only the accident of being exposed to fire, either during food preparation or once discarded, resulted in the preservation of any bone at all from- the site. The high density of the surviving bone elements may also have favored their preservation.

Table 3.15

Bone Identifications

Provenience	Weight	Element	Taxon
32-00-037	0.251g	Phalange	Vertebrate--small mammal, bird, or turtle
70-00-091	0.390g	Metapodial: distal 1/3	Canis sp.
203-00-030	0.235g	Metatarsal: anterior shaft fragment	Odocoileus virginianus
228-00-025	0.563g	Femur fragment (caput)	Mammal--Castor size; probably Castor canadensis
229-00-015	0.507g	Antler fragment?	Cervid?
229-00-030	0.240g	Glenoid fossa[?] scapula fragment	Mammal--medium; possibly small canid
230-00-030	0.213g	Fin ray or rib fragment	Fish--medium or large
231-00-015	0.457g	Humerus, right: distal epiphysis fragment	Small canid--small dog, or fox

Notes: Identifications by A. Spiess, Maine Historic Preservation Commission (see Spiess 1985). Excavated in 1980.

Shell

Number:20 Table:3.16

Marine mollusc shells are rare at 19BN281, and only 7.7 g were recovered during the 1983 excavations. Some uncertainty exists regarding the chronological affiliation of this material. Because it occurs only in Stratum I and the upper 10 cm or so of Stratum II, it is possible that the shell is either contemporaneous with the prehistoric pottery, or the shell may be post-contact in age.

Other Late Archaic sites of coastal Massachusetts have produced shell deposits varying from diffuse to dense (Ritchie 1969b; Dincauze 1974:48; Hancock 1984: Fitzgerald 1984).

Horizontal Distribution of Artifacts

The analysis of the stratigraphy in Chapter 2 indicates that plow disturbance in the IIA horizon extended no more than about 10 cm below the I/II interface. The majority of the assemblage comes from depths of 10 cm BI or greater. Since only a small portion of material from each excavation unit lies within the plow-disturbed layer, it is reasonable to combine both the plow-disturbed and the undisturbed material in a description of the distribution of artifacts across the excavation area.

Figures 3.9 through 3.18 display the distributions of artifacts per excavation unit in the paleosol (Stratum II). Each figure is composed of two parts; the upper portion is a graphic representation of the distribution, and the lower portion provides the values used to construct the diagram. All of these excavation units have the same areas and nearly the same volumes, so no correction factor need be employed to compare quantities of artifacts among the units. The figures employ quartiles as breakpoints to highlight low, moderate, and high values. Simplification is the sole intent behind the use of quartiles; greater detail can be grasped from examination of the actual values. The quartiles are calculated from the 33 excavation units alone.

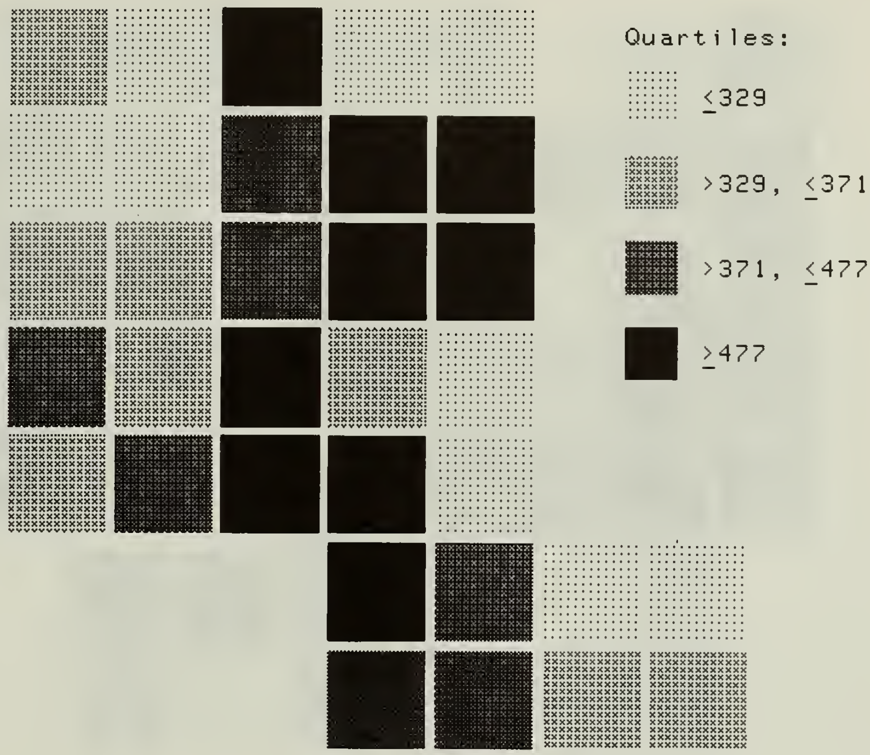
Chipped stone tools and debitage (Figure 3.9) tend to have highest frequencies along a north-south axis in the central portion of the excavation area. Frequencies fall off somewhat to the east and west. One notable aspect of the lithic distribution is the sharpness of some contrasts among values in adjacent units. For example, EU 209, with 1411 lithics, has 1.5 to 4.9 times as many lithics as any adjacent excavation unit. This may indicate that the assemblage retains some pre-agricultural

TABLE 3.16

Shell Weights and Frequencies

Provenience	Taxon	Count	Weight
194-00-015	u	1	0.386
197-00-000	Ma	1	0.238
210-00-005	Mm	1	0.312
214-00-000	u	1	0.461
219-00-005	u	1	0.216
225-00-000	u	1	0.611
227-00-000	u	3	2.533
230-00-000	u	1	0.411
231-00-000	Mm	1	0.291
233-00-010	u	18	20265

Key: Ma-*Mya arenaria*, Mm-*Mercenaria mercenaria*, u-unidentifiable



Actual Values:

349.00	317.00	635.00	286.00	311.00		
243.00	329.00	446.00	1411.00	694.00		
358.00	366.00	477.00	961.00	511.00		
382.00	368.00	659.00	361.00	201.00		
346.00	436.00	830.00	546.00	301.00		
			507.00	431.00	249.00	318.00
			407.00	403.00	357.00	371.00

Horizontal Distribution of Lithics

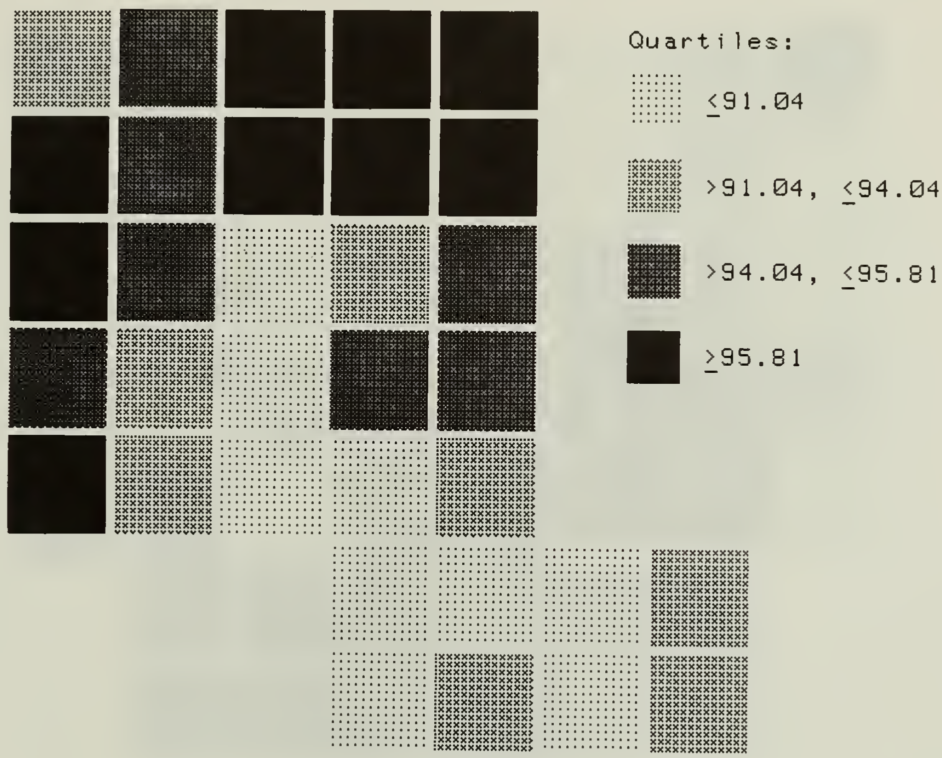
FIGURE 3.9

Actual Values:

4562.70	3373.80	1416.00	1277.00	1049.50		
4224.00	4251.00	4494.60	2990.00	1953.00		
5944.60	5459.60	2407.90	2980.50	3111.20		
4775.70	6052.50	3232.80	2689.30	1805.00		
4094.50	6026.70	4989.70	4273.10	5917.50		
			3692.80	4615.50	4798.10	4704.80
			2276.30	2918.60	2035.80	3195.80

Horizontal Distribution of Fire-Cracked Rock by Weight

FIGURE 3.10

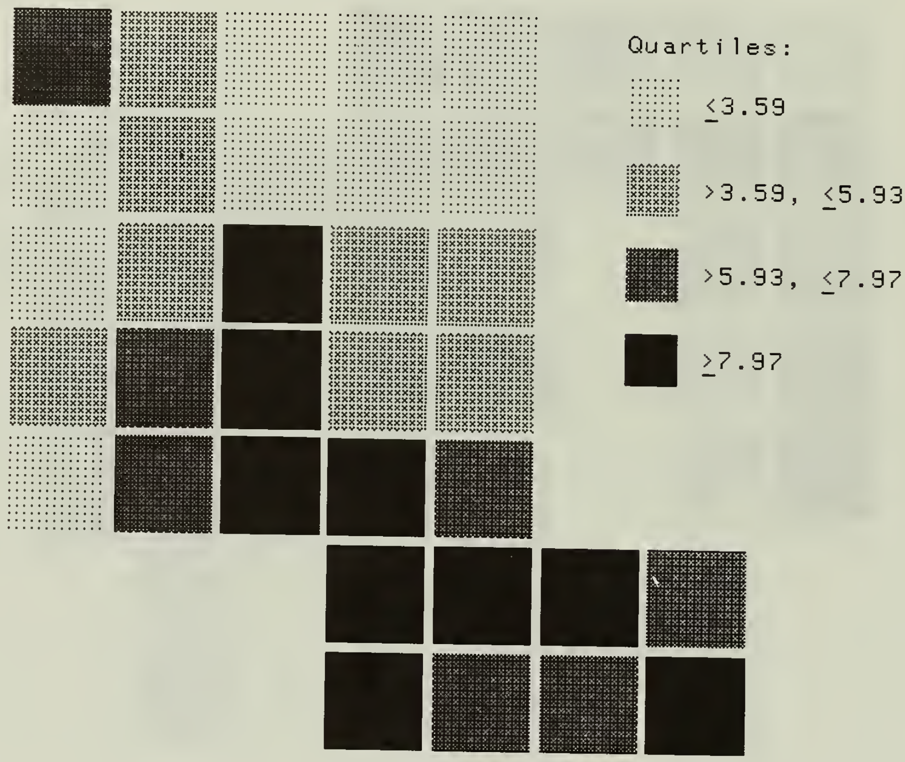


Actual Values:

92.55	95.27	98.43	98.25	98.39		
96.30	94.53	96.19	99.43	97.98		
97.49	95.63	90.78	93.76	94.52		
95.81	93.21	85.43	94.46	95.02		
96.24	94.04	84.34	86.45	92.03		
			82.45	84.45	80.72	91.82
			87.47	92.31	91.04	91.64

Horizontal Distribution of Quartz Percentages

FIGURE 3.11

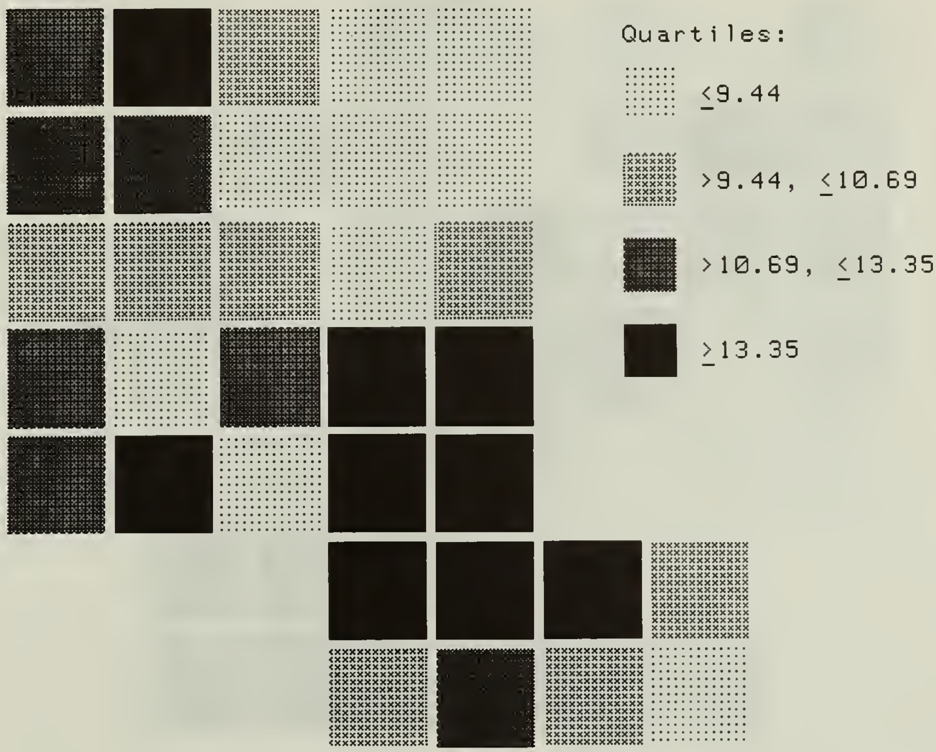


Actual Values:

6.02	4.73	1.57	1.40	1.61		
2.88	5.17	3.59	.50	1.87		
2.51	4.37	9.01	5.93	5.28		
3.66	6.25	14.57	5.54	4.48		
3.47	5.96	15.54	13.19	7.97		
			17.36	15.55	17.27	7.55
			8.60	7.20	7.56	8.09

Horizontal Distribution of Felsic Volcanic Rock Percentages

FIGURE 3.12

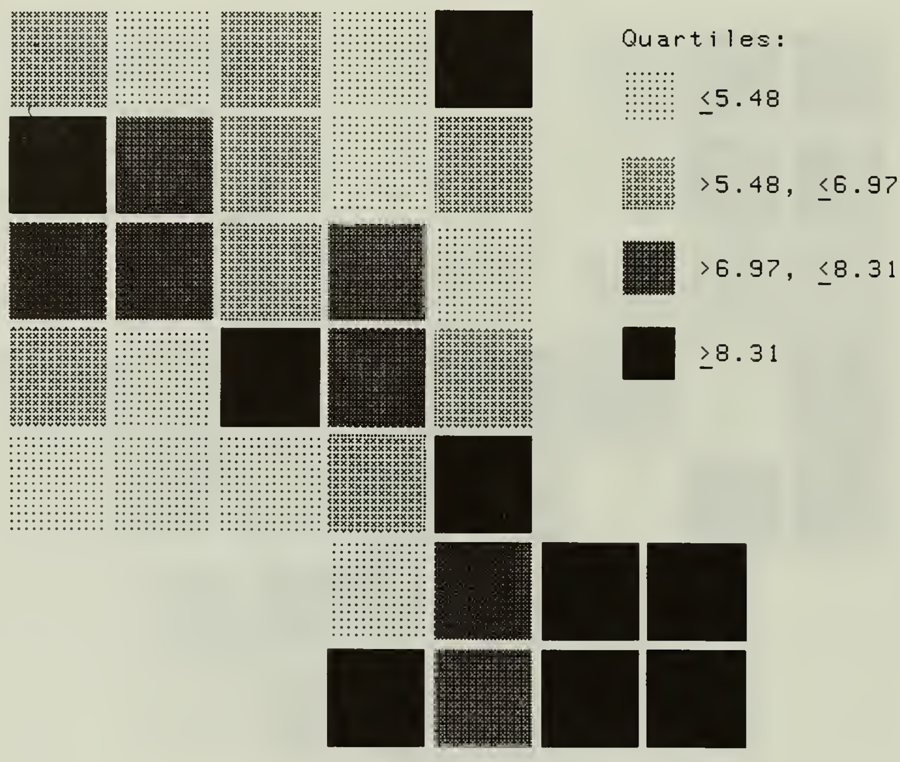


Actual Values:

11.75	15.77	10.55	9.44	8.68		
11.93	12.77	7.17	7.37	8.65		
9.50	9.56	10.48	8.64	9.78		
13.35	8.97	11.38	13.85	17.41		
12.14	13.99	8.67	13.74	15.61		
			17.55	18.56	16.47	10.69
			10.07	11.91	9.80	8.89

Horizontal Distribution of Flake Percentages

FIGURE 3.13

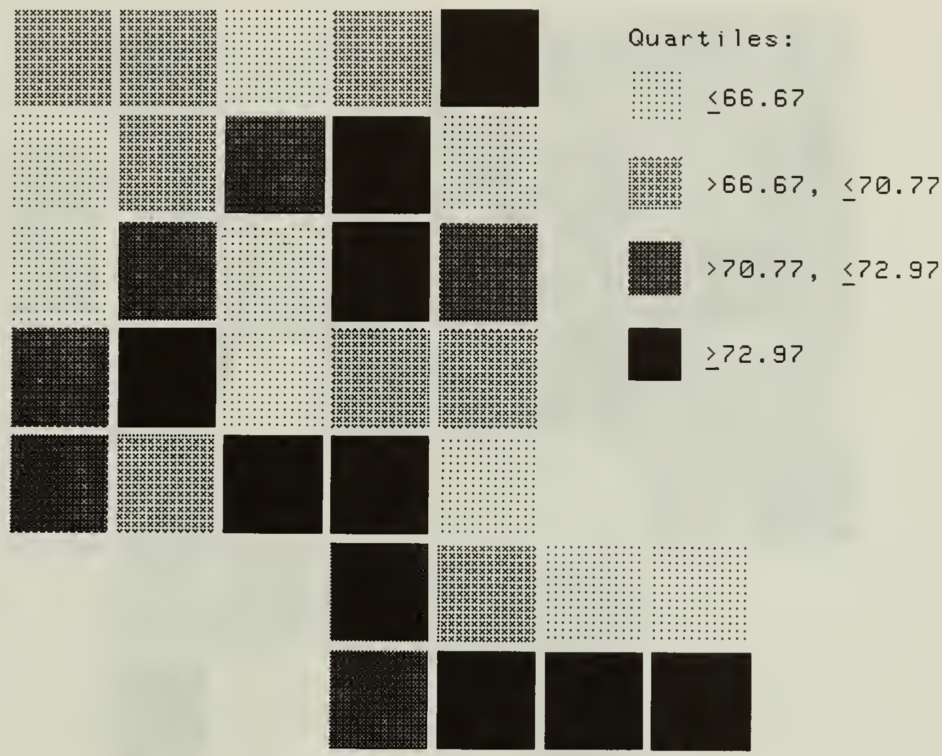


Actual Values:

5.73	4.10	6.93	1.40	8.36		
8.64	7.60	6.73	4.75	6.77		
7.26	7.38	6.29	7.39	5.48		
6.28	3.53	9.10	8.31	6.97		
5.20	5.28	4.70	6.78	10.63		
			4.93	7.42	9.24	12.58
			12.29	8.19	9.52	8.63

Horizontal Distribution of Decortication Flake Percentages

FIGURE 3.14

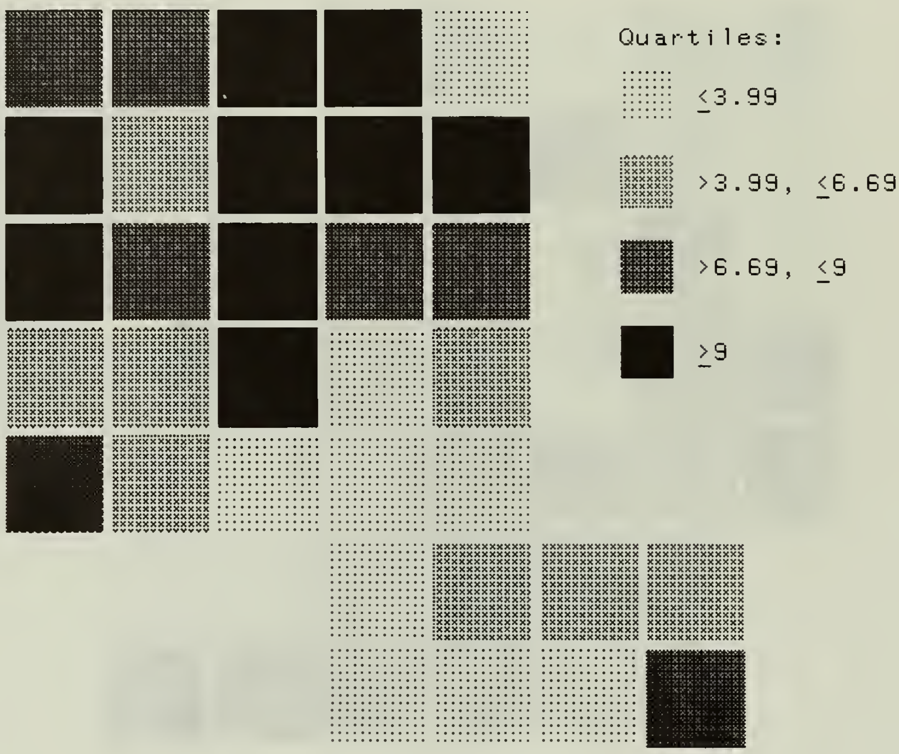


Actual Values:

70.77	67.82	65.98	70.28	77.49		
53.91	69.60	71.52	75.83	66.28		
63.13	72.40	63.10	73.99	72.02		
72.77	77.45	65.25	70.36	68.16		
71.68	70.64	80.72	74.73	66.11		
			72.78	67.05	64.26	66.67
			72.97	75.43	75.07	74.12

Horizontal Distribution of Trim Flake Percentages

FIGURE 3.15

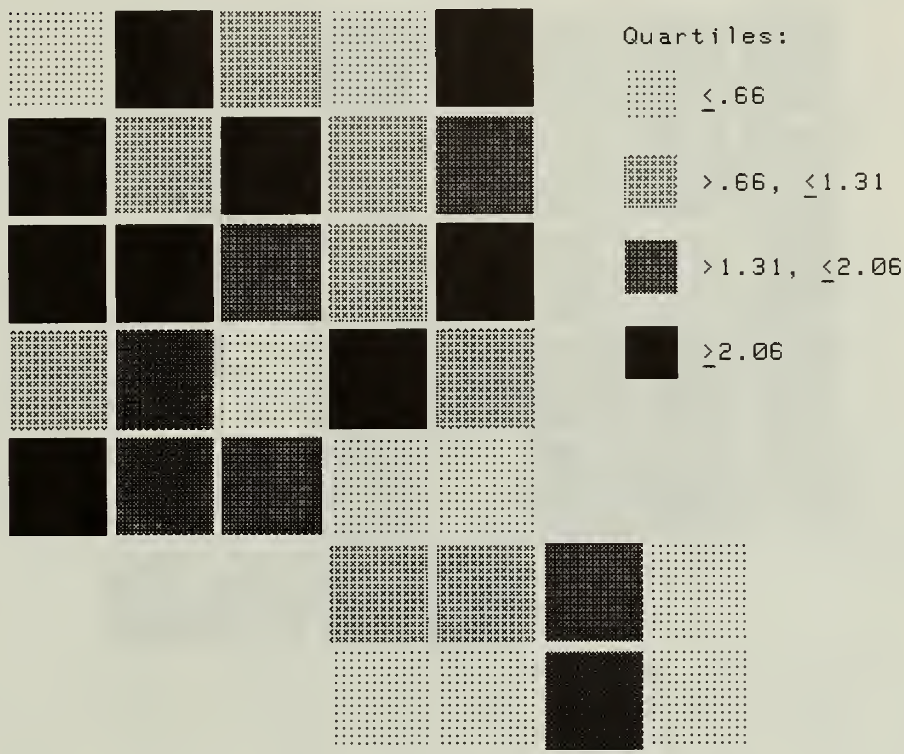


Actual Values:

8.88	7.89	13.39	17.48	1.61		
17.70	6.69	11.43	10.63	15.27		
13.41	7.10	16.77	8.43	9.00		
4.71	6.52	10.93	3.32	4.98		
7.80	5.73	2.29	3.48	3.99		
			2.17	5.10	5.22	5.97
			3.44	2.73	2.52	7.28

Horizontal Distribution of Shatter Percentages

FIGURE 3.16

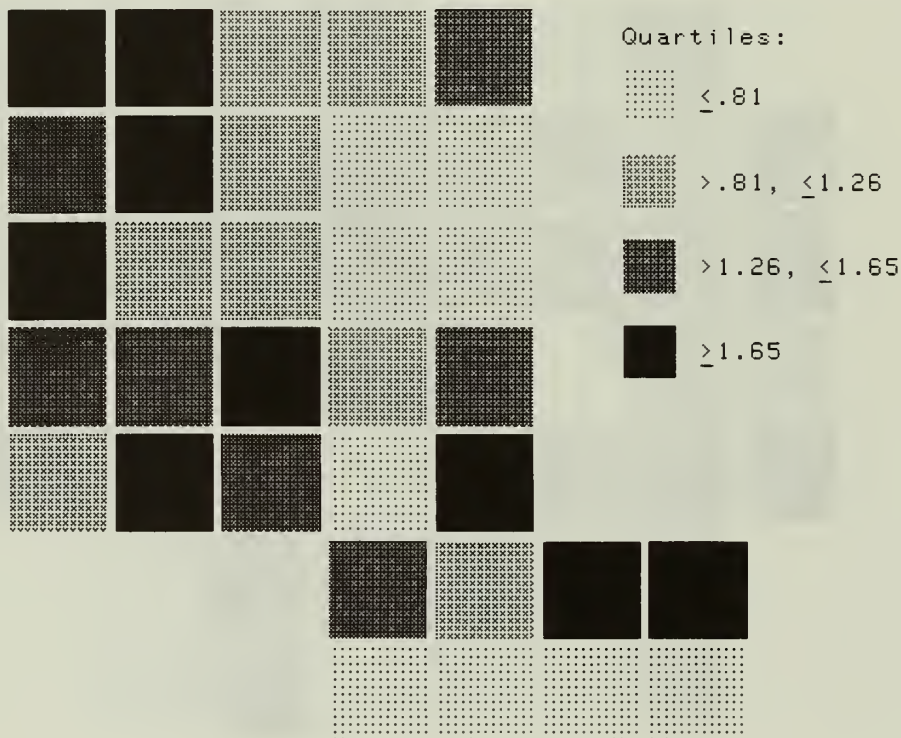


Actual Values:

.57	2.21	1.10	.35	2.25		
5.35	.91	2.24	1.06	1.59		
3.91	2.19	1.68	.73	3.13		
1.31	1.36	.61	2.49	1.00		
2.31	2.06	1.45	.55	.66		
			1.18	.70	1.61	.31
			.49	.50	1.68	.27

Horizontal Distribution of Block Percentages

FIGURE 3.17



Actual Values:

2.29	2.21	1.26	1.05	1.61		
1.65	1.82	.90	.35	.72		
2.23	1.09	1.26	.52	.59		
1.57	1.36	1.97	.83	1.49		
.87	2.06	1.33	.73	2.99		
			1.38	.93	2.01	2.20
			.49	.74	.56	.81

Horizontal Distribution of Biface Percentages

FIGURE 3.18

integrity, supporting the suggestion that plowing has not homogenized the distribution of artifacts.

Fire-cracked rock weights (Figure 3.10) are highest in a band running northwest to southeast, with the northeastern corner of the excavation area showing the lowest weights. Fire-cracked rock frequencies have the same general pattern as weights, although not all excavation units fall into the same quartile for both variables (data not shown).

High density areas of lithics and fire-cracked rock thus appear to diverge, with little overlap between them. Only EU 223 falls into the upper quartile of both lithic frequency and fire-cracked rock weight.

Among lithics, high percentages of quartz and felsic volcanic rocks cluster at opposite ends of the excavation area (Figures 3.11 - 3.12). Quartz percentages are highest in the northern and western portion, while the percentages of felsic volcanic rocks are highest in the southern and western area. The percentages of shatter and block (Figures 3.16 - 3.17) tend to be higher in the northwestern part of the excavations, and percentages of decortication flakes (Figure 3.15) and general flakes (Figure 3.13) tend to be highest in the southeastern section. High percentages of bifaces (Figure 3.18) and trim (Figure 3.15) flakes appear to be somewhat more scattered than those of other technological categories.

Interpreting these patterns is difficult. Major difficulties arise because of the unknown nature of the occupational history of the site, the small area of investigation, and the classification scheme for the artifacts. Also, to reiterate something noted in Chapter 2: no features, stains, or clusters were noted during excavation, so the patterns represent general variations at a scale of 0.5 m to 1 m or so. The nature of the occupation has major implications for interpreting the distributions. If this portion of the site represents only a single episode of occupancy, then the patterns may reflect differential use of the space. If the area was repeatedly occupied, then any clustering of artifacts may be the product of nothing more than the chance overlap of debris from different episodes of occupation. Turning the question around to ask what the distribution implies about the nature of site occupation might be useful, but here the problem of the scale of the excavation intrudes. In such a small area, it is difficult to decide what represents clustering and what represents randomized scatter or overlapping clusters. Further, clustering may exist at several scales, beginning at less than 1 square meter, and clusters at different scales may arise for different reasons, none of which may reflect past human action. Finally, there is the issue of the categories used for the percentages. The discussion of the debitage earlier in this chapter indicates that for the most part the categories are insufficiently rigorous to reflect unequivocally a limited portion of the manufacturing,

maintenance, use, and discard cycle of chipped stone artifacts. Thus one is at a loss to interpret the co-occurrence of categories of manufacturing debris if each category might signify several steps in the manufacturing process.

In brief, the figures are presented for their descriptive character. More thought, more sorting and more classifying are needed to extract more information from these distributions.

CHAPTER 4

19BN281: A Discussion

Affiliation and Age

Affiliation

The Late Archaic of southern New England was dominated by three cultural traditions: the Laurentian, the small stemmed point, and the Susquehanna (Ritchie 1969b:213-224; Dincauze 1974:47-50). Each tradition marks a general lifeway pattern, including a distinctive environmental adaptation, shared by communities spread over a wide geographic area; in the archeological record, each is represented by a distinctive suite of artifact forms and tool kits and a specific site location pattern (Goggin 1949:17-20; Tuck 1971:349-350; Dincauze 1974:47). Not all researchers agree that the tripartite division of Late Archaic lifeways in southern New England is either useful or appropriate (e.g., Snow 1980:187-190, 211-233), but a detailed consideration of this issue is beyond the scope of this report. The notion of three cultural traditions is useful in this study because it facilitates an estimation of component age (in the absence of reliable radiocarbon dating) and provides some boundaries for intersite comparisons. In addition, Mahlstedt (1985) successfully employed the tripartite scheme in his recent synthesis of Cape and island prehistory, showing that the framework retains its utility.

Of the three subdivisions, it is an easy matter to assign the component at 19BN281 to the small stemmed point tradition, but whether the assignment can be made more specific and what this implies in terms of component age are other matters entirely. The only formally recognized subdivision of the small stemmed point tradition in southern New England is the Squibnocket complex, which Ritchie (1969b:215-219) defined on the basis of assemblages from the Hornblower II and Vincent sites on Martha's Vineyard. Ritchie (1969b:219) envisions the Squibnocket complex as a rather typical band level Archaic culture, living on

the seacoast or along large rivers in the late fifth millenium BP.

He describes the manifestation of the complex at the Hornblower II site thus:

> the principal artifacts of this complex are projectile points of three types, viz., Wading River, its probable derivative, the Squibnocket Stemmed, and the Squibnocket Triangle, nearly all of quartz and clearly representing a quartz pebble industry. There is no sure evidence for the use of sidenotched points, although two specimens of this kind were found. Nor, despite the single rude stemmed scraper and trianguloid knife, is there sufficient cause to attribute chipped stone scrapers, drills and perhaps knives to this complex.
>
> Rough or ground stone components of the complex comprise the chopper, plummet, unpitted pebble hammerstone, probably both graphite and hematite paint stones, and possibly the plano-convex adz. Polished splinter awls were the rare and only bone items found in Stratum 3. . . .(Ritchie 1969b:215).

In addition, excavation of Stratum 3B at the Vincent site showed the complex´s assemblage to include:

> the rude, notched atlatl weight, retouched flake knife, strike-a-light, and probably, bolstering the meager evidence of the Hornblower II assemblage, the trianguloid knife and the cylindrical pestle. The barbed antler harpoon head, the conical antler projectile point, cylindrical antler flaker and deer ulna awl may also provisionally be included in this amplified list of traits of the Squibnocket complex (Ritchie 1969b:215).

The assemblage at 19BN281 has several of these traits, and others, as well. Stemmed biface (projectile point) types include the Wading River and Squibnocket Stemmed varieties, but the Squibnocket Triangle is virtually absent (Borstel 1984b:Table 8.4). Only one Squibnocket Traingle was recovered during the 1980 field season (from EU 94, Concentration 281.24) and EU´s 201-233 produced none in 1983. Cape (Group 1) Stemmed bifaces, described in Chapter 3, comprise the majority form at the site. This variety accounts for 52.5% of all projectile points from the site, and thus occupies a position within the assemblage that is numerically similar to the Wading River Stemmed at both Hornblower II, Stratum 3 and Vincent, Stratum 3A on Martha´s Vineyard (Ritchie 1969b:Figure 18).

As at the type stations of the Squibnocket complex, the lithic assemblage from 19BN281 is overwhelmingly quartz, averaging about 94% by frequency, and debitage clearly indicates the reduction of quartz pebbles into tools.

Formed unifaces (scrapers) are absent from the 19BN281 assemblage. The blade of one of the Cape Stemmed bifaces excavated in 1983 has been modified into a small convex form, similar in edge plan to a scraper or a strike-a-light, and an additional example was excavated in EU 76, 10 m west of EU 206, during the 1980 season. It is also worth pointing out that the absence of scrapers is by no means a trait exclusive to the Squibnocket complex on the coast of Massachusetts. Scrapers are rare in both Archaic and Woodland contexts on outer Cape Cod.

Comparison of the remainder of 19BN281's lithic assemblage with Ritchie's data reveals both similarities and differences. In addition to stemmed bifaces, the 1983 excavations recovered 140 non-stemmed bifaces (Table 3.1). Assuming Ritchie (1969b:39, 151) reports all bifaces, including rejectage, this is a much larger quantity in terms of both density and in proportion to stemmed bifaces than the Squibnocket complex produced. This may be a product of both differences in site depositional history (the Martha's Vineyard sites are shell middens) and site function. Since Ritchie (1969a,b) does not define his term "knife", specific comparisons of bifaces are somewhat uncertain. If by that word he means well-thinned non-stemmed bifaces (ovoid or trianguloid in plan), as seem to be illustrated in various plates of his publications (e.g., 1969b: Plate 11- Figures 23 and 25, Plate 42- Figure 21, Plate 43- Figure 13), then there are artifacts from 19BN281 that could certainly be termed ovate and trianguloid knives. "Chopper" is also undefined; apparently these are boldly flaked, thick bifaces (e.g., Ritchie 1969b:Plate 11- Figure 26, Plate 43- Figures 19,20). The 19BN281 assemblage also has examples of this class.

Site 19BN281 produced five ground stone tools, including a gouge, a large plummet, a bead, and two abrasive stones. Ritchie regards plummets as a clear trait of the complex, but the three from Hornblower II, Stratum 3 (1969b: Plate 12- Figures 36-38) are considerably smaller than the 19BN281 specimen. Ritchie's excavations on Martha's Vineyard recovered only one gouge, a specimen from Stratum 3 of the Peterson site (1969b:184, Plate 54- Figure 28). This stratum produced a mixed assemblage of Squibnocket complex and Susquehanna tradition material, so it is not known which component was responsible for the gouge. At other small stemmed tradition sites in the region, for example, at Bear Swamp II (Barnes 1972:368), gouges also form part of the assemblage. Hammerstones are present in the 19BN281 assemblage but these artifacts are so ubquitous at Archaic and Woodland sites of the Northeast as to be of little diagnostic value.

Soil acidity was such that only the tiniest scraps of bone were recovered from the site (see Chapters 2 and 3), so no comparisons are possible for tools of this material.

In sum, the assemblage from site 19BN281 has a reasonable resemblance to those of the type stations for the Squibnocket complex. The strongest similarities lie in the presence of Wading River points and in the range of quartz bifaces at both localities. To the extent that the absence of scrapers and drills is diagnostic of a cultural complex, 19BN281 also parallels the Martha's Vineyard sites. One of the differences to be noted between the 19BN281 assemblage and that of the complex's type sites is the virtual absence of Squibnocket Triangles. Ritchie (1969b:244) calls this type "a definite trait of the Squibnocket complex," by which he seems to mean that on Martha's Vineyard it is not a Laurentian element (cf. "In the Hudson Valley the Beekman Triangle point seems to represent a modal variant of the Squibnocket Triangle . . . In the Hudson Valley, the Beekman Triangle is a Laurentian trait [Ritchie 1969b:244]".). It is unclear whether he regards the occurrence of this type as a <u>necessary and sufficient</u> condition for placement of a component specifically in the Squibnocket complex. In his brief comparison of the Squibnocket complex with the "coeval" Sylvan Lake complex of the Hudson Valley, Ritchie (1969b:218) writes that the absence of Squibnocket Triangle points in the latter is one of the "chief elements of difference between the two complexes". Funk's (1976:254) more recent assessment reiterates this observation. On the other hand, Ritchie (1969:31-32) regards Wading River projectile points from Stratum 1B at the Hornblower site as evidence of a component "affiliated with the Squibnocket complex", even though no Squibnocket Triangles were recovered from this layer of the site, and even though elsewhere he writes that the Wading River type is "a non-diagnostic point form and a questionable horizon marker" (Ritchie 1969:54).

The similarities between the assemblages are sufficient, given the lack of explicitness in Ritchie's definition, to place the 19BN281 assemblage tentatively in the Squibnocket complex. The motive for doing so is to suggest that groups of people who shared much of their culture in common were probably responsible for both the Martha's Vineyard and the 19BN281 assemblages. This allows, in the following section, a chance to guess-date the site. In making this analytical connection, the differences between the assemblages should not be overlooked. Indeed, Mahlstedt (1985) has proposed a new entity, the Cape Stemmed tradition, to subsume assemblages like 19BN281's. One of the key attributes of this tradition is presence of Cape Stemmed bifaces. However, it is not entirely clear whether Malhstedt (1985) means to set up this tradition as the Cape Cod equivalent to Ritchie's complex, or whether he is using the term "tradition" in the more restrictive sense of a technological tradition. Furthermore, in asking about the relationship of the 19BN281 and Martha's Vineyard assemblages contextural differences must be kept in

mind. Ritchie carried his work out in shell middens, while 19BN281 is a non-midden site. Many differences may signify differences in site function and not cultural or chronological separateness.

Age

Intrasite dating. The age range for the Late Archaic material excavated in 1983 appears to be substantially the same as that of the site as a whole. All portions of the site produce similar varieties of stemmed bifaces, but the data are too scanty to judge whether the proportions of the groups is similar throughout the site. Cursory examination of the assemblages excavated in 1979 and 1980 indicates that non-stemmed bifaces are also similar across the site. Quartz dominates the stone tool assemblage everywhere on the site, and the percentages of this material from all parts of the site stand out in comparison to other sites in the park. Of 78 concentrations having 100 or more lithics, 18 of the 19 highest percentages of quartz were produced by concentrations at 19BN281 (Borstel 1984c:Table 15.10). Stratigraphy is similar across the site (Borstel 1984a:199-203, 222), and no areas have produced man-made deposits, such as middens. Thus, at this stage in the investigation of the site, the Late Archaic component appears to be chronologically homogenous, but further excavation in other sections may reveal this homogeneity to be an illusion resulting from limited sampling.

The site also has limited evidence for a Middle or Late Woodland component. This evidence consists mainly of prehistoric ceramics. In addition to the material recovered in 1983, ceramics come from ten excavation units; all of these are fairly close to the 1983 excavations. The vertical distribution of the small quantities of shell indicate that they, too, may be from the Woodland period (see Chapter 2). Further support for this interpretation comes from the site's only radiocarbon date (see below and Appendix 2). No stone tools can be referred to the Woodland period. The occurrence of two felsic volcanic Cape Stemmed (Group 1) bifaces shows that felsic volcanic rock, along with quartz, was used during the Late Archaic at 19BN281.

Absolute dating. The chronometric age of the Late Archaic component at 19BN281 is uncertain. A single radiocarbon date on shell from the site, 1090 ± 80 BP (I-13,692) (Appendix 2), is obviously far too late to relate to any manifestation of the small stemmed point tradition. No other material suitable for dating has yet been recovered from the site. The scattering of charcoal through the sediments excavated in 1983 seemed most often to originate from filled-in animal burrows and may well be of very recent age. Analysis of a fragment of calcined bone indicated that all organic carbon is gone, so even an accelerator date would not yield a reliable result.

Thus, at this time the only avenue open to estimating the age of the site is by comparison with other, dated, assemblages, and in this approach lurk potenially large inaccuracies. The essential difficulty is that the small stemmed point tradition is such an amorphous entity or spans so wide a period of time that, as one of the author's colleagues put it, "Pick any date in the Late Archaic, and you could be right." Table 4.1 illustrates this, showing an age range of more than 2000 years for manifestations of the tradition at various sites in the Northeast. Close comparison between these sites and 19BN281 can reduce this range, although that estimate may still be in error.

Beginning on the outer Cape itself, there are no dated assemblages like 19BN281 (Table 4.2). This is something of a surprise, considering the presence of components dating to the fourth and late fifth millenia B.P. Indeed, none of the dates produced by the Park Service's survey (Borstel 1984b:245-268; Fitzgerald 1984) refers unequivocally to any specific phase or tradition of the Late Archaic.

Having assigned the 19BN281 assemblage to the Squibnocket complex, it would be reasonable to hypothesize that the site fell within the complex's established age range, especially since the type localities on Martha's Vineyard are a mere 80 km to the southwest. Ritchie (1969b) is cautious in his dating of the complex. He regards the date of 4140 ± 100 BP (Y-1529) from Stratum 3 of the Hornblower II site (Table 4.1) as approximating the time of the appearance of the complex on Martha's Vineyard (Ritchie 1969b:215, 230). Ritchie (1969b:215, 230) implies, but does not explicitly say, that the complex as a distinct prehistoric cultural entity ends with the introduction of the Susquehanna tradition, sometime between 4000 BP (Dincauze 1972:56-57) and 3500 BP (Ritchie 1969a:136). (Borstel [1982:65] includes a short discussion of the age of this tradition.) However, the technological tradition of manufacturing small stemmed projectile points continues into the Early Woodland period (Ritchie 1969b:219, 230), based upon the distribution of Wading River projectile points at the Hornblower II, Vincent, Peterson, and Pratt sites (Ritchie 1969b:34-38, 145-150, 181, and 76, respectively). Radiocarbon assays from Peterson and Pratt sites (Table 4.1) indicate that this type may persist as late as about 2500 BP.

Dincauze's assessment of the age range (>4600 - 3400? BP) of the small stemmed point tradition in eastern Massachusetts parallels that of Ritchie. The tradition appears in the area before 4600 years ago, based on the Bear Swamp I date of 4640 ± 80 BP (Table 4.1) (Dincauze 1976:128), and was well established by 4300 years ago (Dincauze 1974:48). The small stemmed point tradition co-existed with the broadspear tradition throughout the fourth millenium BP, the "cultural and presumably social separation" of the two ceasing after 3000 BP "when traits of both appear blended in the Orient phase" (Dincauze 1974:49). Her handling of the three radiocarbon dates from Stratum 4A of the

TABLE 4.1

Selected List of Radiocarbon Dates for the Small Stemmed Point Tradition

DATE	LAB-NO	ASSOCIATION	SITE	REFERENCE
4750±120	Y-1761	Taconic tradition	Twombly Landing	Brennan 1977:422-4 & T 1
4725± 80	GX- 762	Taconic tradition	Twombly Landing	Brennan 1977:422-4 & Table 1
4640± 80	Y-2499	Small stemmed point	Bear Swamp 1	Staples and Athearn 1969:5
4545±140	GX-2417	Wading River complex	Shoreham	Wyatt 1977:402
4390±180	GX-1749	Small point tradition	Neville	Dincauze 1976:113 and Table 8
4305±180	GX-7411	Small stemmed Point tradition	Bay Street I	Ritchie 1981:103
4160±140	Y-1536	Sylvan Lake complex	Sylvan Lake Rockshelter	Funk 1976:166
4140±100	Y-1529	Squibnocket complex	Hornblower II	Ritchie 1969:25, 52
4020±115	I-3103	Squibnocket complex	Peterson	Ritchie 1969:193
4015±150	GX-7574	Small Stemmed point tradition	Bay Street I	Ritchie 1981:104
4000± 85	DIC- 183	Sylvan Lake complex	Sylvan Lake Rockshelter	Funk 1976:166
3715±180	GX-7410	SStr pts w/Vinette-like ceram	Bay Street I	Ritchie 1981:106
3710±120	GX-2417	Wading River complex	Wading River	Wyatt 1977:403
3670±185	GX-7575	Small stemmed point tradition	Bay Street I	Ritchie 1981:104
3605±145	GX-7576	Small stemmed point tradition	Bay Street I	Ritchie 1981:104
3470±135	GX-7082	Small stemmed point tradition	Newcomb Street	Ritchie 1981:108
3445±130	GX-1920	Susquehanna tradition	Neville	Dincauze 1976:113 and Table 8
3250±180	GX-7089	Small stemmed Point tradition	Bay Street I	Ritchie 1981:108-110
3025±185	GX-2529	Susquehanna tradition	Neville	Dincauze 1976:113 and Table 8
2540±105	I-3101	Wading R's assoc w/E Woodland	Peterson	Ritchie 1969:181, 192
2470±120	Y-1531	Wading R's assoc w/E Woodland	Pratt	Ritchie 1969:70, 85
595± 90	--------	Wading R pp w/L Woodland Matl	Pleasant Hill	Wyatt 1977:406

TABLE 4.2

List of Radiocarbon Dates
Older than 3000 B.P. from CACO Sites

DATE (B.P.)	LAB #	PROVENIENCE	CONCENTRATION	REFERENCE
4180±90	I-13, 475	313-00-068	308.33	Fitzgerald 198
3925±180	GX-9703	802-00-052	308.00	Borstel 1984b
3410±80	I-13, 464	307-00-066	308.33	Fitzgerald 198
3350±170	GX-9702	300-00-094	308.33	Borstel 1984b
3315±145	GX-9706	9-03-110+115	390.33	Borstel 1984b
3260±135	GX-9700	107-06-061	308.42	Borstel 1984b

Neville site (Table 4.1), however, implies that she now believes that the stemmed point tradition began to lose its identity earlier, by not later than about 3400 BP:

> . . . Sample 1749 [4390 ± 180 BP] is by far the most acceptable. It falls with the range of radiocarbon ages elsewhere associated with small stemmed points . . ., and it is consistent with both its natural and cultural stratigraphic relationships. In spite of the fact that there is no evidence in the site records, Samples 2529 and 1920 [3025 ± 185 BP and 3445 ± 130 BP, respectively], with their fourth millenium dates, may have been intruded into Stratum 4A from Strata 3 or 2, where artifacts of the appropriate ages were recovered (Dincauze 1976: 113).

Duncan Ritchie's (1981:114) recent report on work in the Taunton River in southeastern Massachusetts seems to confirm the long span of "quartz technologies affiliated with the Small Stem Point tradition." The radiocarbon assays from the Bay Street I and Newcomb Street sites (Table 4.1) are at present difficult to evaluate completely because Ritchie does not describe the precise stratigraphic relationships between the samples and the artifacts, nor does he fully enumerate the associated assemblages.

In contrast, Richardson's (1983) new excavations at Hornblower II indicate that in undisturbed contexts Wading River and Squibnocket projectile points are always beneath Susquehanna tradition materials. This, if it can be confirmed on a wider geographic scale, implies (among other things) a more restricted time range for the tradition than that presently cited by most authors.

Data from eastern New York present a similarly unclear picture. In the middle Hudson River valley, the Sylvan Lake complex is the local version of the small stemmed point tradition, and both Ritchie (1969:218, 230) and Funk (1976:254) are impressed with the similarities between this complex and the Squibnocket complex on Martha's Vineyard. Funk (1976:250) assigns the Sylvan Lake complex an age range of ca. 4350 BP to ca. 3850 BP, using both the dates from Sylvan Lake Rockshelter (Table 4.1) and bracketing dates from chronologically adjoining complexes. He seems skeptical of the age range for Brennan's (1977:422-424) "Taconic tradition", 5000-3800 BP, in the lower Hudson (Funk 1976:251). Wyatt (1977) reports that the minimum age range for the Wading River complex on Long Island is about 4500 BP to 3700 BP, but along with many authors, sees a long persistence for the small stemmed point tradition (Wyatt 1977:405-406). Few archeologists, however, would regard Wyatt's Pleasant Hill date (595 ± 90 BP) (Table 4.1) as an indication of anything but the inclusion of a residual Wading River projectile point in a Late Woodland pit.

The consensus of opinion seems to be that the small stemmed point tradition, under whatever name, appears in eastern Massachusetts by around 4500 BP and that by roughly 3500 BP (at the latest), it was changing into (or being replaced by) something other than the sort of entity that occurs at sites like Hornblower II and Vincent (Ritchie 1969b), Bear Swamp II (Barnes 1972), and Neville (Dincauze 1976). This range appears to be the best age estimate currently possible for 19BN281. The similarities of the site to W. Ritchie's Squibnocket complex along with D. Ritchie's (1981:114) observation that during the lifespan of the small stemmed point tradition, quartz declined somewhat in popularity, suggest that the true age range for the site may actually lie in the earlier half or two-thirds of that millenium.

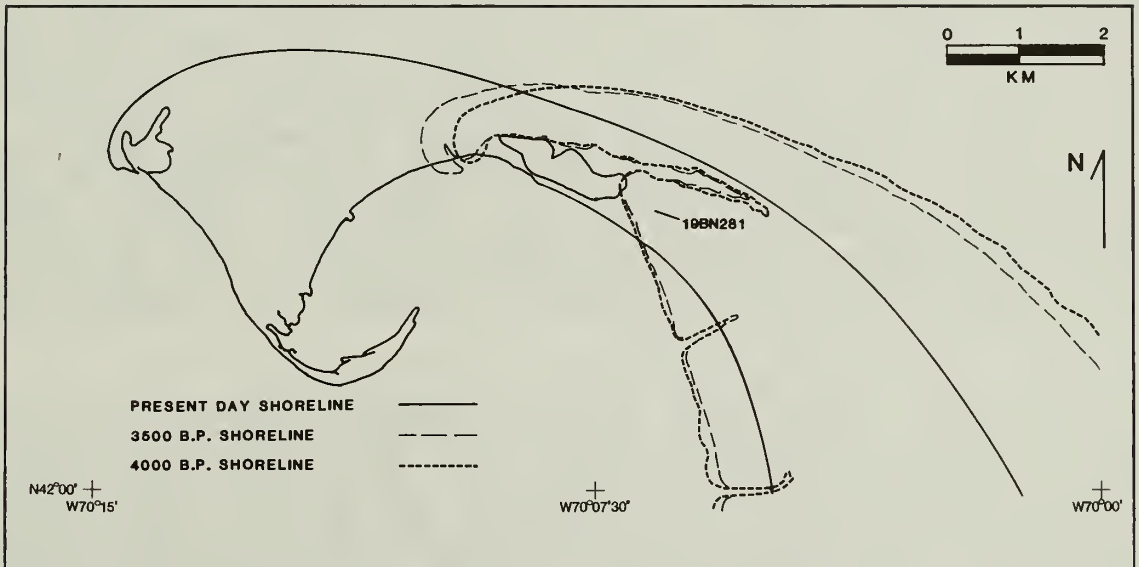
Site Function

The artifacts from 19BN281 attest to a range of activities carried out at or from the site during the Late Archaic period. Together, these activities begin to indicate how the site functioned within the subsistence/settlement system of these people. Interpretation of the function(s) of any one site must relie on more than simply a catalog of the activities that took place there; site function must also be evaluated by comparison to other sites and with such factors as season(s) of occupation firmly in mind. Certain aspects of such an analysis are somewhat beyond the scope of this report and others, such as, season of occupation, are simply not recorded by the evidence at hand. Thus, a more complete understanding of the function of 19BN281 awaits additional study of collections and site patterning from the outer Cape and beyond.

Paleoenvironmental Setting

Assigning an age to the assemblage at 19BN281 allows a brief discussion of the site's setting at the time it was occupied. The uncertain dating for the site presents no more than a minor inconvenience, for it forces the discussion to consider the setting over the span of a millenium centered on 4000 BP. This might be a constraint that would exist independently of the dating for the site, given the temporal and geographic resolution of the available paleoenvironmental data.

Shorelines. Rising sea level, erosion, and deposition all acted through the Holocene to shape the outer Cape shoreline into its present arcuate form. From 4500 BP to 3500 BP sea level rose steadily, from about -9.3 m to about -6.3 m, at an average rate of 0.3 m/100 yr (Redfield and Rubin 1962; Oldale and O'Hara 1980:Figure 1). The rising sea gradually drowned the shoreline in protected places, such as the long, narrow embayment between



SHORELINE POSITIONS CA. 4,000B.P.
(AFTER O'DONNELL & LEATHERMAN, 1980)

FIGURE 4.1

the High Head escarpment and the southern side of the Provincelands Hook (Figure 4.1).

More substantial changes took place along the exposed coast, where erosion continued to cut into the glacial drift, as it had for the previous five millenia (Zeigler et al. 1965:R307). The strength of the wave attack during storms is a key factor affecting the rate of erosion on outer Cape Cod, so O'Donnell and Leatherman (1980:8) believe average erosion rates to have been similar to those of the present day -- ca. 0.3 m/yr on the Cape Cod Bay shoreline and ca. 0.76 m/yr on the Atlantic Ocean side.

During the millenium, between 4500 and 3500 BP, the Provincelands Hook extended itself about 2 km to the west and began to curve a bit to the south (Zeigler et al. 1965:303-306). As the hook grew, East Harbor (now Pilgrim Lake) in front of the escarpment became increasingly protected. This probably allowed fringing salt marshes to expand at least along the shore, if not out from it. Growth of the hook may also have meant that the cove's resources were greater at 3500 BP than they had been at 4500 BP.

Vegetation. The period 4500-3500 BP falls within Winkler's (1985:308) pollen subzone 3c at Duck Pond in Wellfleet. This subzone, lasting from ca. 5000 BP to ca. 2200 BP, marks a period when the forests of the outer Cape were slowly changing from a pine barren-like community to a more mesophytic one (closer to that present at Contact). Oak, pitch pine (*Pinus rigida*), and white pine (*Pinus strobus*) dominated the woodlands. Beech, birch, hickory, maple, ash, elm, and ironwood were less prominent components, growing mostly in the protected hollows (Winkler 1982:68). Unlike the following period, subzone 3d, at Duck Pond there is no suggestion in the lake sediments that people were intentionally burning the forests to affect their composition or structure (Winkler 1985:308).

In brief, the Late Archaic people probably had their settlement in a pine-oak woodland. The protected cove (now Pilgram Lake) and the bay shoreline lay at nearly their present distances from the site. However, the Atlantic shoreline was further away than it presently is (Figure 4.1). Paleoecological information is presently insufficient to judge the productivity of the cove and to determine whether features such as clam flats were available.

Chipped Stone Tools in Systemic Context

Although it is not obvious from the percentages of technology classes alone, the lithic assemblage excavated in 1983 provides clear evidence of all stages of chipped stone tool manufacture, from initial reduction to final shaping and tool maintenance (cf. McManamnon 1984e:40). This section summarizes

the major stages in the cycle, as represented in the 1983 assemblage, from raw material procurement to final discard

<u>Getting the raw material</u>. The Late Archaic people probably obtained the great majority of the rock they used from within a few kilometers of the site. The varieties of quartz and felsic volcanic rocks in the archeological assemblage are similar in lithology, cortex characteristics, and shape to stones in the local glacial drift (Moffett 1944; Borstel 1984c). Although these comparisons have not been made in a systematic and quantitative fashion, the author's familiarity with both the archeological and the naturally occurring material makes him confident that the similarities are present and are meaningful. The presence of stones in the earliest stages of reduction and the proportions of technology types are further indications that most of the raw material is local. None of these considerations excludes the possibility that a small proportion of the rock used at the site was non-local, but it has not yet been possible to recognize any cultural material from 19BN281 that is made of exotic rock types.

The "lithic landscape" (Gould and Saggers 1985:124) of Cape Cod consists entirely of glacial drift and drift-derived shoreline deposits (Borstel 1984c). No bedrock crops out anywhere on the Cape (Oldale 1969:Figure 1), so raw materials for making stone tools occur locally only as pebbles and cobbles. The people of 19BN281 could have collected a few stones from the patches of bare ground around the camp; doubtless they filled a small fraction of their raw material needs in this way. They might also have dug pits to gather stones from the ground, but this seems less likely. Both of these strategies would have provided only a few stones for a relatively large effort.

By far the most abundant sources for stones on outer Cape Cod are the unprotected ocean and bay beaches, where erosion of the glacial drift assures a continuing supply and waves and currents winnow away the finer sediments (Borstel 1984c). Beaches where stones were abundant lay at easy walking distance, one to four kilometers from the site. Beaches are dynamic, and today the abundance of stones on the outer cape varies with changes in the beach profile. Whenever collecting conditions were good (Borstel 1984c:306-309) and raw materials were needed, people from 19BN281 went down to the beach to gather stones. They also collected stones incidently, while they were at the shore for other reasons.

Elsewhere the author suggested that to reduce the effort of bringing large amounts of rock back to their households, the "stoneworkers are likely to have carried out initial reduction, blank preparation, or even later stages of tool making on beaches or on nearby cliff tops" (Borstel 1984c:309). It is possible that this suggestion is incorrect or that it is a too broad generalization, because the artifacts recovered indicate reduction of numerous pebbles on the site. However, it is more

likely that because the distance to the sources were short and because quartz pebbles tend to be small (Borstel 1984c:293), people brought much (though not necessarily all) material to the site in the form of unmodified cobbles and pebbles, instead of beginning reduction at the beach. Quartz stones vary considerably in their quality and in other characteristics as well, but data are insufficient to indicate what criteria the people employed in collecting stones on the beach.

Making tools. The stoneworkers of 19BN281 used two types of blanks for making bifaces. Some bifaces were shaped directly from pebbles or cobbles, and others were made from flakes.

Several bifaces have cortex on both faces, which is clear evidence that a pebble blank was employed. One strategy was to remove all the cortex from one face before turning the pebble over to begin work on the opposite face (Figure 4.2). Thicker pebbles might have been approached differently, by alternating faces to remove the cortex and begin thinning the piece at the same time.

The curved longitudinal sections of a few bifaces indicate that they were made from flakes. Flake blanks may have been produced in several ways. There is little evidence for carefully prepared and maintained cores at 19BN281. Such cores may have been used at the site, but they may not now be recognizable because they were thoroughly exhausted. More likely, pebbles were rapidly reduced to flakes with little attention being paid to the production of flakes of a consistent form. Instead, the stoneworker simply picked out those flakes that might be most useful from the mass of those produced. Stoneworkers may also have used other reduction techniques, such as bipolar reduction or outright cobble smashing (Ritchie 1981). The relative importance of these strategies has not been assessed for 19BN281. Also, the majority of bifaces are uninformative about whether they were made from cobbles or from flake blanks. Initial shaping and reduction produced several kinds of debitage, including decortication flakes, some blocks, and some shatter.

Non-stemmed bifaces at 19BN281 provide indications of two, and perhaps more, modal forms (Figure 4.2). The Late Archaic stoneworkers produced both lanceolate (Group 1) and leaf (Group 2) non-stemmed bifaces. These forms can be identified among bifaces of varying degrees of refinement in their edges, plans, and sections (subgroups A-D). Stoneworkers used both pebble and flake blanks to produce each form. Differentiation of these forms began early in the reduction sequence, for some subgroup A lanceolate and leaf bifaces are quite thick and minimally worked. The details of the shaping process have not been worked out, but rejectage produced during manufacture included trim flakes, shatter, regular flakes, and decortication flakes. As reduction proceeded from initial shaping to final finishing, the proportion of decortication flakes probably declined and the location of cortex probably shifted from dorsal surface to platform. Of

FIGURE 4.2. Pebbles in initial stages of reduction.

course, reduction also produced failed bifaces; some of these can be placed in Groups 1 or 2, but others fall into the miscellaneous categories. The third non-stemmed biface group, ovate, may represent another intentionally produced form. On the other hand, the ovate bifaces may be those which stoneworkers rejected because, for one reason or another, they were unable to shape into leaf or lanceolate forms.

Do the leaf and lanceolate bifaces represent finished tools in their own right? Barring a more detailed examination of the assemblage, a firm answer is impossible. Comparisons among the leaf and lanceolate non-stemmed bifaces and the Cape Stemmed and Small Stemmed bifaces suggest that not all well-shaped non-stemmed bifaces are finished tools. It is plausible to suggest that some portion of the leaf bifaces were further shaped to produce the Cape (Group 1) Stemmed bifaces, and, similarly, some of the lanceolate bifaces were further worked to produce Small (Group 2) Stemmed bifaces (Figure 4.3).

Use. Observations on the morphology of the stemmed bifaces are suggestive of differences in the use of Cape Stemmed and Small Stemmed bifaces. First, there is the matter of size: Cape Stemmed bifaces weigh several times more than Small Stemmed bifaces. Second, the Cape Stemmed bifaces are commonly resharpened, but this does not appear to be the case for most Small Stemmed bifaces. Finally, Cape Stemmed bifaces show a consistent pattern of breakage at the shoulders, suggesting both a specific hafting technique and specific mode of use. One possibility is that the Small Stemmed bifaces are projectile tips for javelin-like weapons, while the Cape Stemmed bifaces may be general-purpose hafted tools. Some Cape Stemmed bifaces were probably re-sharpened at the site, given the prevelence of this attribute in the assemblage, so a portion of the trim flakes (and general flakes?) are products of blade rejuvenation.

The examination so far undertaken on the 19BN281 assemblage provides little additional information on the use of these tools. One issue to be resolved is, as just noted, the uses to which the non-stemmed bifaces were put. Another question is the extent to which flakes were being used as casual tools.

Discard. Discarded material comprises at least manufacturing rejectage (flakes, blocks, etc. and obviously failed pieces), a few broken small stemmed bifaces, and many of the Cape Stemmed bifaces. These last were discarded either when they snapped in their hafts or when their blades had been resharpened beyond usefulness. Interestingly, no biface blade fragments could be refitted onto the Cape Stemmed bases. This may indicate that breakage occured elsewhere and the bases were removed from their hafts when the users returned to camp.

Summary. Clearly, all phases of chipped stone tool manufacture are represented by the assemblage excavated in 1983. It is not possible to determine the relative importance or

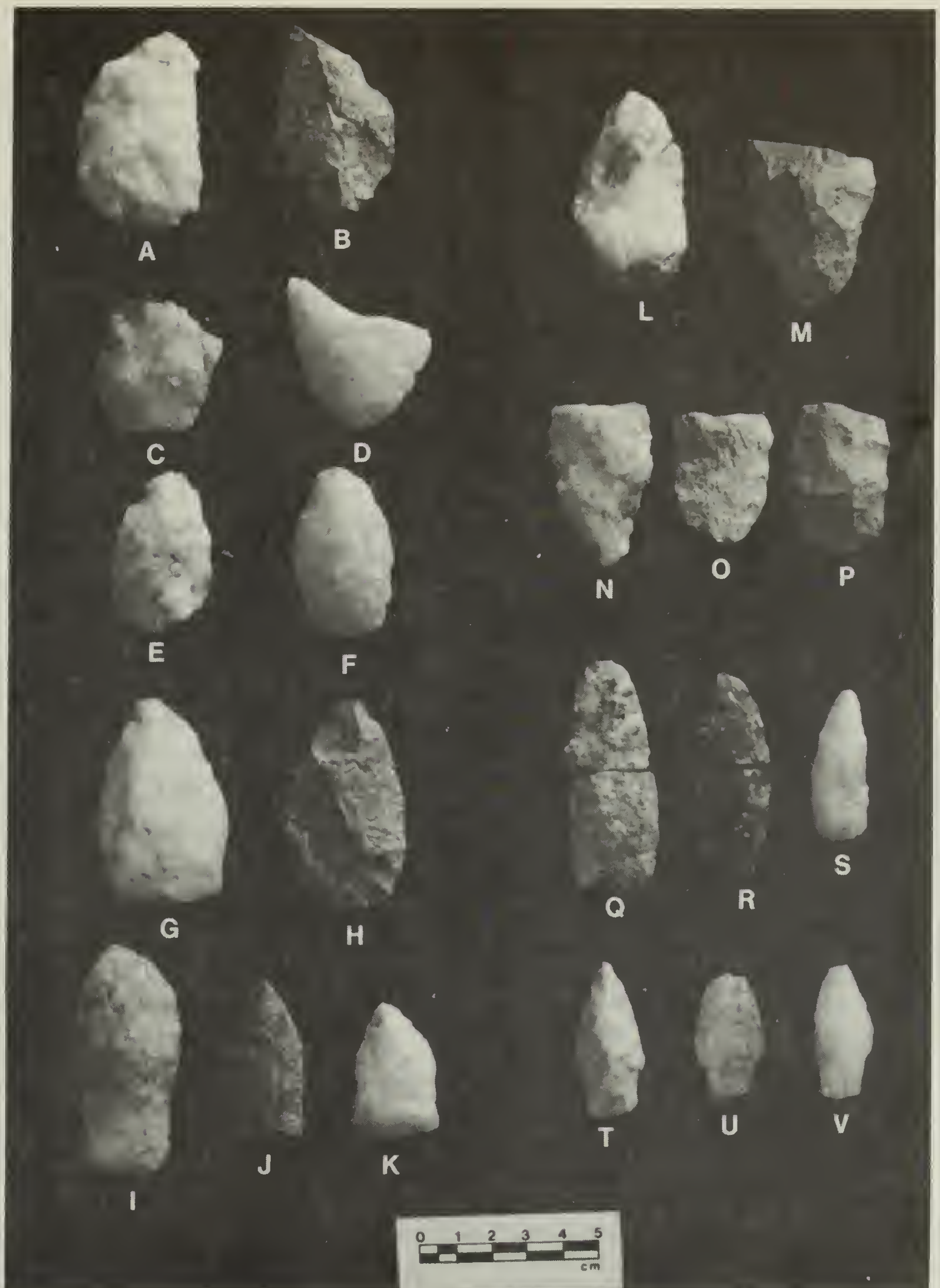


FIGURE 4.3. Hypothetical reduction sequences - Cape Stemmed and Wading River Stemmed bifaces. A-H, Group 2 (leaf) non-stemmed bifaces; A-B, Group 2A; C-D, Group 2B; E-F, Group 2C; G-H, Group 2D; I-K, Group 1 (Cape) stemmed bifaces; L-S, Group 1 (lanceolate) non-stemmed bifaces; L-M, Group 1A; N-P, Group 1B; Q-S, Group 1C; T-V, Group 2 (Wading River) stemmed bifaces.

proportions of activity involved with early production, late production, and rejuvenation, but in terms of the important/unimportant scale McManamon (1984d) employs, all three categories are important in this part of 19BN281.

Other Activities

In addition to the manufacture, use, and rejuvenation of chipped stone tools, information that can be gleaned from the 19BN281 assemblage is limited. The material recovered in 1983 re-enforces McManamon's (1984e 380-383) contention that this part of the site reflects a wide range of activities.

The presence of the gouge may indicate that people were engaged in woodworking, either to manufacture implements or to construct facilities while at the site. The abrasive stones suggest wooden, bone, or stone tool sharpening, either to maintain tools or to manufacture them. The hammerstones may be part of the stone tool making kit or they may have been used for some other purpose, such as pigment grinding or food preparation.

The plummet may indicate fishing, but firm evidence that people from 19BN281 fished is provided by a calcined fin ray or rib fragment from a medium or large fish. The rarity of shell at the site is problematic. Their rarity is probably partly a reflection of preservation effects. People probably did not deposit them in sufficient quantities to buffer the acidic soil of the site and preserve them in substantial quantities. Does this mean Late Archaic people at 19BN281 did not consume much shellfish? This is certainly one possibility; it is also possible that people from 19BN281 gathered shellfish and processed or consumed them near the tidal flat, leaving most shells close to the shore. Even the association of shellfish with the Late Archaic component is open to question, given that a quantity of shells from EU 134 produced a radiocarbon date of about 1100 BP. If this could be demonstrated, it would be interesting to explore why people bothered to bring stone to the site to turn into tools, but not bring whole shellfish to the site to eat. Other faunal material is also skimpy: people hunted and trapped in the woods and marshes and brought the game to the site. Beyond noting that they hunted meduim and large mammals, nothing specific can be said about hunting practices.

Finally, the quantities of fire-cracked rock suggest that the use of fire —for cooking, drying/smoking, and for heating--was common.

Intrasite Patterning

The spatial structure of 19BN281 at both the scale represented by the 1983 excavations and on the scale of the site as a whole is patchy. High and low artifact densities alternate over short horizontal distances. McManamon (1984e:383)

has plausibly suggested that this pattering is the result of small, repeated, overlapping occupations. To this should be added the effects of post-occupation alterations.

One notable aspect of the 1983 excavation is the failure to recover intact facilities, such as hearths or pits. Previously, failure to discover such features had been attributed to the testing strategy alone: hearths and other features were too difficult to recognize in small test units, and they were too widely dispersed to be encountered by the small units. Intact features within the area examined in 1983 would have been difficult to miss, since 33 square meters in a contiguous block were exposed.

Generalizing from a single case is, of course, unrealistic, but the 1983 excavations seem to indicate that despite the large quantities of fire-cracked rock, intact hearths are rare. Absence of features may reflect one or more of the following: the Late Archaic occupants didn´t construct them; through the period of occupation, people repeatedly constructed facilities (specifically, hearths), demolishing older ones and perhaps recycling materials; natural transformational processes altered or destroyed the features following final abandonment of the site. As outlined in Chapter 2, the transformational model proposed by Thomas and Robinson (1980:19-36) seems sufficient to account for the lack of features, such as pits, floors, and lightly built facilities. Not enough research has been done to determine whether a similar model might also apply to density features, such as thick, heavily fired hearths.

Function. The term "camp" comes to mind to describe the nature of the habitation at 19BN281. By camp is meant a temporary settlement, occupied for periods of days to weeks, within which people carried out a variety of domestic and industrial activities, while they extracted resources from the surrounding landscape. The preceeding discussion provides a very incomplete list of the activities that took place at or from the site; these include: stone tool manufacture and maintenance, woodworking, food processing, stone gathering, hunting, and fishing.

The reasons people chose to stay where they did and the ways in which the activities articulated with those at other places cannot always be ascertained on the basis of a single site. The following observations are in order regarding these topics. The site is situated so that it is near several kinds of shoreline features, but not immediately adjacent to any of them (Figure 4.1). The location seems to represent a compromise position relative to marine and possibly terrestrial resources. The site is large and has a fairly high density of materials. It contrasts with smaller "inland" sites, such as 19BN434 on the upper reaches of Wellfleet´s Herring River (Borstel 1984b:282-283), in which the totality of the assemblage is a few dozen to a few hundred. Small stemmed point tradition site

patterning seems to contrast with that of the Late Woodland period; sites from the Late Archaic appear to be much more widely dispersed across the landscape than those of the Late Woodland, which seem more strongly clustered along the shore. Finally, the site lacks shell deposits.

Summary and Conclusions

The 1983 excavations at 19BN281 built on previous fieldwork, as this analysis has built on previous studies of the site. On the basis of this work, the following has been determined:

1. Artifacts rest within a paleosol that is buried by windblown sand from nearby glacial drift. Burial probably took place in the nineteenth century.

2. Prior to burial, the site was used as an agricultural field; plowing does not appear to have penetrated to the main zone of high artifact density.

3. This zone exists because of past depositional alteration of the archeological materials. A model proposed by Thomas and Robinson (1980) appears applicable to this site.

4. The artifact assemblage represents two components. The major one is a manifestation of the Late Archaic small stemmed point tradition, possibly affiliated with Ritchie's (1969b) Squibnocket complex, and estimated to date about 4000 BP ($\pm$ 500 yr). The minor component is Middle-Late Woodland, dating to ca.1500-500 BP.

5. Artifacts from the Woodland component are sparse, and this component contributed little or nothing in the way of lithics.

6. Analysis of the Late Archaic component provides evidence of two common stemmed biface forms. One of these types, the Cape Stemmed form, has just been recognized as having a widespread distribution on Cape Cod. These may be functionally different, contemporary tool types.

7. The lithic assemblage indicates that all stages of stone tool manufacturing are represented in the 1983 excavation area, and several forms of bifaces can be traced through several manufacturing steps. Manufacturing at the site may include the production of Wading River and Cape Stemmed bifaces.

8. For the first time in Park Service's survey, excavation recovered a gouge, a plummet, and abrasive stones in association with materials of the small stemmed point tradition.

9. Faunal material is associated with the Late Archaic assemblage. This material indicates the people exploited both marine and terrestrial habitats while at the site.

10. The horizontal distribution of artifacts recovered in 1983 does not contradict the hypothesis that the site was repeatedly occupied on a short term basis (days to weeks), with geographic overlaps among successive occupations.

Future Directions

This report has put forth many suppositions and hypotheses, so the artifact assemblage from 19BN281 holds considerable potential for future work. Much of the work needs to be carried out not only at 19BN281, but at other sites as well (and in old collections) to provide a comparative framework. From this framework will come a fuller understanding of the Late Archaic on Cape Cod.

More work can be done with site sediments. Soil chemistry should be examined to search for evidence of decomposed shell and bone. The full extent of the nineteenth century sand sheet should be mapped. The vertical distribution of artifacts could be further investigated by completing the analysis of the column samples. The entire question of post-depositional movement needs much experimental work to refine the model.

Future studies of the artifacts should seek to verify the reduction sequence that has been outlined in Chapters 3 and 4. Refitting studies might be one avenue to persue in such an investigation. Another area of work is the refinement of the classification of debitage so that it better reflects specific steps in the reduction process. Tool function also needs more work; this could be pursued by such methods as wear analysis as well as newer methods like the blood extraction technique recently described by Loy (1983). A complete examination of rock cortexes of archeological materials, including both chipped stone and fire-cracked rock would provide specific evidence that beaches or other exposures were sources of rock.

The horizontal distribution of arifacts needs more thought and more work. The analysis should demonstrate more firmly the nature of the diachronic community patterning at 19BN281 and to test this against specific alternatives.

APPENDIX 1

Results of Soil Analyses

TABLE A1.1

Proveniences of Samples Submitted For Grain Size Analysis

EU	Sample #	Horizon	Beg Depth	End Depth	Catalog #
203	1.02	IC	5.00	10.00	16715
203	1.04	IC	15.00	20.00	16716
203	2.10	IC-plowsc	26.50	30.00	16722
203	1.06	IIA	27.50	32.50	16717
203	1.07	IIA	32.50	37.50	16718
203	1.08	IIA	37.50	42.50	16719
203	1.10	IIA	47.50	52.50	16720
211	2.08	IC	12.00	15.00	16723
211	2.10	IC-plowsc	24.00	27.00	16724
211	2.06	IIA	27.00	30.00	16725
211	2.05	IIA	33.00	35.00	16726
211	2.04	IIA	37.00	39.50	16727
211	2.03	IIB2	42.50	45.00	16728
211	2.02	IIB2	51.00	55.00	16729
223	1.02	IA/C	5.00	10.00	16704
223	1.04	IC	15.00	20.00	16705
223	1.06	IC	25.00	30.00	16706
223	2.10	IC-plowsc	30.00	33.50	16721
223	1.08	IIA	35.00	40.00	16707
223	1.09	IIA/B2	40.00	45.00	16708
223	1.10	IIB2	45.00	50.00	16709
223	1.11	IIB2	50.00	55.00	16710
223	1.13	IIB2	60.00	65.00	16711
223	1.17	IIB2	80.00	85.00	16712
223	1.23	IIB3	130.00	135.00	16713
223	1.24	IIC	170.00	175.00	16714
233	2.08	IC	11.00	14.50	16730
233	2.10	IC-plowsc	30.00	33.00	16731
233	2.06	IIA	24.00	26.50	16732
233	2.05	IIA	26.50	28.50	16733
233	2.04	IIA	31.00	33.00	16734
233	2.03	IIB2	37.00	40.00	16735
233	2.02	IIB2	48.00	51.00	16736
HH	2.01	IC	19.00	29.00	16737
HH	2.01	IC	17.00	25.00	16738
HH	2.01	IC	16.00	26.00	16739

TABLE A1.2

Percentages of Major Sediment Fractions

EU	Sample #	Horizon	Pct Gravel	Pct Sand	Pct Silt	Pct Clay
203	1.02	IC	.10	90.80	7.70	1.40
203	1.04	IC	.20	92.60	5.70	1.50
203	2.10	IC-plowsc	.21	96.12	2.92	.74
203	1.06	IIA	1.50	87.90	9.00	1.60
203	1.07	IIA	2.20	85.30	11.00	1.50
203	1.08	IIA	2.80	83.50	12.40	1.30
203	1.10	IIA	2.80	86.20	9.80	1.20
211	2.08	IC	.09	91.53	6.33	2.05
211	2.10	IC-plowsc	.59	91.95	6.47	.98
211	2.06	IIA	.67	88.84	8.56	1.93
211	2.05	IIA	1.09	84.81	12.62	1.48
211	2.04	IIA	5.70	80.47	12.13	1.71
211	2.03	IIB2	1.05	84.21	12.87	1.87
211	2.02	IIB2	.83	86.33	11.60	1.25
223	1.02	IA/C	.02	91.00	8.10	.90
223	1.04	IC	.05	91.00	7.50	1.50
223	1.06	IC	.40	96.00	2.80	.80
223	2.10	IC-plowsc	.20	94.61	4.16	1.02
223	1.08	IIA	1.00	87.10	10.90	1.00
223	1.09	IIA/B2	3.10	83.00	12.30	1.60
223	1.10	IIB2	3.00	82.50	10.40	4.10
223	1.11	IIB2	3.60	84.00	10.70	1.70
223	1.13	IIB2	2.60	84.90	9.20	3.30
223	1.17	IIB2	7.70	85.40	5.40	1.50
223	1.23	IIB3	2.00	97.00	.70	.30
223	1.24	IIC	1.00	89.00	6.20	3.80
233	2.08	IC	0.00	88.99	10.12	.89
233	2.10	IC-plowsc	.17	96.79	2.53	.51
233	2.06	IIA	2.29	88.35	8.03	1.33
233	2.05	IIA	2.16	87.86	7.32	2.66
233	2.04	IIA	1.53	88.75	8.32	1.40
233	2.03	IIB2	2.75	84.22	10.55	2.49
233	2.02	IIB2	2.90	85.25	9.24	2.61
HH	2.01	IC	.27	96.90	1.72	1.12
HH	2.01	IC	.10	96.58	1.90	1.42
HH	2.01	IC	.21	97.33	1.37	1.09
HoM	2.01	IC	0.00	99.83	.12	.05
HoM	2.01	IC	0.00	99.94	.05	.02

HoM	2.01	IC	0.00	5.00	16740
HoM	2.01	IC	0.00	7.00	16741

Notes: Sample numbers beginning with 1 are wall samples; sample numbers beginning with 2 are column samples. Beginning and end depths are given in cm below ground surface (BS) at sample location. HH samples are off-site controls from High Head area, 300 m west of site. HoM samples are off-site controls from Head of the Meadow Beach.

TABLE A1.3

Inclusive Graphic Method Sample Statistics
(In Phi - Units)

EU	Sample #	Horizon	Median	Mean	Sd	Sk	Kurt
203	1.02	IC	2.03	2.09	1.35	.15	1.01
203	1.04	IC	1.92	2.19	1.11	.40	1.04
203	2.10	IC-plowsc	1.72	1.83	1.04	.18	.95
203	1.06	IIA	1.89	2.07	1.44	.26	1.05
203	1.07	IIA	1.63	1.88	1.80	.17	1.13
203	1.08	IIA	2.28	2.33	1.50	.11	1.10
203	1.10	IIA	1.95	2.08	1.42	.20	.99
211	2.08	IC	2.17	2.26	1.26	.26	1.22
211	2.10	IC-plowsc	2.35	2.27	1.20	-.01	1.06
211	2.06	IIA	2.18	2.19	1.40	.17	1.26
211	2.05	IIA	2.04	2.18	1.53	.22	1.03
211	2.04	IIA	1.77	2.01	1.95	.12	1.37
211	2.03	IIB2	2.07	2.22	1.65	.26	1.02
211	2.02	IIB2	1.82	2.08	1.48	.31	.92
223	1.02	IA/C	2.14	2.22	1.26	.18	1.04
223	1.04	IC	2.31	2.43	1.10	.33	1.12
223	1.06	IC	1.79	1.88	.98	.16	.98
223	2.10	IC-plowsc	1.84	1.94	1.09	.18	1.04
223	1.08	IIA	2.08	2.10	1.50	.14	.88
223	1.09	IIA/B2	1.75	2.07	1.94	.11	1.49
223	1.10	IIB2	1.78	2.00	2.39	.13	1.93
223	1.11	IIB2	1.86	1.96	2.27	-.09	1.87
223	1.13	IIB2	2.07	2.13	1.78	.24	1.28
223	1.17	IIB2	1.35	1.44	1.81	.01	1.98
223	1.23	IIB3	1.01	1.20	1.01	.29	1.02
223	1.24	IIC	1.33	1.41	1.52	.36	1.93
233	2.08	IC	2.37	2.51	1.07	.26	.93
233	2.10	IC-plowsc	1.85	1.89	.95	.08	.91
233	2.06	IIA	1.86	1.99	1.43	.24	1.07
233	2.05	IIA	1.83	1.90	1.75	.24	1.31
233	2.04	IIA	1.72	1.83	1.55	.24	1.06
233	2.03	IIB2	1.60	1.87	1.83	.34	1.15
233	2.02	IIB2	1.61	1.85	1.85	.33	1.17
HH	2.01	IC	1.48	1.63	1.13	.21	.77
HH	2.01	IC	1.90	1.96	1.06	.08	.87
HH	2.01	IC	1.89	1.81	1.14	-.05	.74
HoM	2.01	IC	.72	.80	.55	.18	.92
HoM	2.01	IC	.63	.73	.52	.34	1.25

TABLE A1.4

Method of Moment Sample Statistics
(In Phi Units)

EU	Sample #	Horizon	Median	Mean	Sd	Sk	Kurt
203	1.02	IC	2.03	2.24	1.60	.82	4.77
203	1.04	IC	1.95	2.33	1.43	1.15	7.97
203	2.10	IC-plowsc	1.73	1.92	1.27	1.05	8.72
203	1.06	IIA	1.91	2.17	1.79	.48	4.13
203	1.07	IIA	1.64	1.84	2.14	.10	2.54
203	1.08	IIA	2.28	2.33	1.92	-.03	3.87
203	1.10	IIA	1.95	2.19	1.65	.65	3.62
211	2.08	IC	2.18	2.46	1.57	1.07	6.57
211	2.10	IC-plowsc	2.33	2.38	1.41	.70	5.62
211	2.06	IIA	2.18	2.39	1.69	.84	4.72
211	2.05	IIA	2.04	2.29	1.75	.63	3.11
211	2.04	IIA	1.77	1.99	2.13	.23	2.27
211	2.03	IIB2	2.07	2.39	1.85	.65	2.72
211	2.02	IIB2	1.84	2.19	1.68	.69	3.38
223	1.02	IA/C	2.15	2.35	1.45	.81	4.69
223	1.04	IC	2.32	2.60	1.39	1.15	7.61
223	1.06	IC	1.81	1.98	1.26	1.11	10.04
223	2.10	IC-plowsc	1.85	2.05	1.36	1.01	8.09
223	1.08	IIA	2.07	2.22	1.66	.61	2.59
223	1.09	IIA/B2	1.79	2.02	2.09	.08	2.51
223	1.10	IIB2	1.80	2.10	2.51	.28	1.82
223	1.11	IIB2	1.87	1.83	2.40	-.17	2.25
223	1.13	IIB2	2.07	2.33	2.20	.44	2.61
223	1.17	IIB2	1.35	1.35	2.16	.16	3.02
223	1.23	IIB3	1.01	1.22	1.17	.80	9.01
223	1.24	IIC	1.34	1.83	2.02	1.24	6.49
233	2.08	IC	2.39	2.61	1.29	.96	6.43
233	2.10	IC-plowsc	1.86	1.96	1.15	1.00	9.81
233	2.06	IIA	1.87	2.12	1.70	.66	3.91
233	2.05	IIA	1.83	2.13	2.03	.71	3.16
233	2.04	IIA	1.72	1.99	1.79	.69	3.35
233	2.03	IIB2	1.63	2.04	2.10	.64	2.54
233	2.02	IIB2	1.63	2.06	2.12	.66	2.41
HH	2.01	IC	1.50	1.73	1.44	1.09	8.43
HH	2.01	IC	1.91	2.07	1.41	1.14	9.67
HH	2.01	IC	1.88	1.90	1.41	.93	7.79
HoM	2.01	IC	.73	.81	.61	1.43	26.54
HoM	2.01	IC	.64	.77	.59	1.51	15.87

TABLE A1.5

Lithic and Fire-Cracked Rock Fractions, EU 203 Column

Interval (cm BS)	Horizon		Lithics a	Lithics b	Lithics c	Lithics total	FCR a	FCR b	FCR total
5-10	IC	n				0			0
		wt				0			0
15-20	IC	n				0			0
		wt				0			0
27.5-32.5	IIA	n	5	16	9	30	6	7	13
		wt	4.896	0.706	0.119	5.724	8.940	0.745	9.665
32.5-37.5	IIA	n	12	13	17	42	2	6	8
		wt	6.487	0.858	0.294	7.639	0.892	0.609	1.501
37.5-42.5	IIB2	n	11	20	8	39	8	6	14
		wt	34.296	1.315	0.113	35.724	103.60	0.839	104.44
47.5-52.5	IIB2	n	3	16	4	23	6	0	6
		wt	0.874	0.846	0.058	1.778	15.260	0	15.260

Key: a=>0.25 in; b=0.25 - 0.125 in; c=0.125 - 2 mm.

TABLE A1.6

Lithic and Fire-Cracked Rock Fractions, EU 223 Column

			Lithics				FCR		
Interval (cmBS)	Horizon		a	b	c	total	a	b	total
5-10	IA/IC	n				0			0
		wt				0			0
15-20	IC	n				0			0
		wt				0			0
25-30	IC	n	3	2	2	7	1	0	1
		wt	3.076	0.111	0.016	3.203	12.128	0	12.128
35-40	IIA	n	4	4	9	17			0
		wt	2.910	0.234	0.120	3.364			0
40-45	IIA/IIB2	n	11	14	22	47	2	7	9
		wt	4.118	0.819	0.305	5.242	6.498	0.982	7.480
45-50	IIB2	n	7	20	12	39	31	1	32
		wt	49.23	1.454	0.175	50.86	44.80	0.652	45.45
50-55	IIB2	n	5	21	11	37	11	4	15
		wt	3.229	1.282	0.220	4.731	43.061	0.493	43.554
60-65	IIB2	n	2	8	5	15	0	1	1
		wt	0.955	0.157	0.059	1.171	0	0.156	0.156
65-70	IIB2	n	3	2	0	5			0
		wt	1.718	0.165	0	1.883			0
80-85	IIB2	n	0	1	0	1			0
		wt	0	0.021	0	0.021			0
130-135	IIB3	n							0
		wt							0

170-175	IIC	n	0
		wt	0

Key:a=>0.25 in; b=0.25 - 0.125 in; c=0.125 - 2 mm

TABLE A1.7

pH Values of Soils from Selected Proveniences

EU 203 - North Wall   Water pH - 5.0   Water Temp - 30 c

Cat #	Sample #	Horizon	Depth Range (cm BS)	pH
16755	1	IIB	61-65	3.9
16754	2	IIB	50-53	3.7
16753	3	IIB	38-41	3.8
16752	4	IIA	33.5-36.5	3.9
16751	5	IIA	29-31.5	3.7
16750	6	IIA	23.5-26.5	3.9
16749	7	IC	18-21	4.1
16748	8	IC	9.5-12	3.9
16747	9	IA	3-6.5	3.7
16722	10	IC/ Intrusion	26.5-30	4.2

EU 211 - West Wall   Water pH - 4.5   Water Temp - 27 c

Cat #	Sample #	Horizon	Depth Range (cm BS)	pH
16758	1	IIB	62-65	3.65
16729	2	IIB	51-55	3.9
16728	3	IIB	42.5-45	3.9
16727	4	IIA	37-39.5	3.95
16726	5	IIA	33-35	4.15
16725	6	IIA	27-30	4.25
16723	7	IC	20-23	4.0
16757	8	IC	12-15	3.9
16756	9	IA	5-8	3.7
16724	10	IC/ Intrusion	24-27	4.1

EU 223 - South Wall   Water pH - 5.0   Water Temp - 30 c

Cat #	Sample #	Horizon	Depth Range (cm BS)	pH
16767	1	IIB	66-70	4.0
16766	2	IIB	55-58	4.1
16765	3	IIB	47-50	4.0
16764	4	IIA	38-41	4.5
16763	5	IIA	34-35.5	4.2
16762	6	IIA	29-32	4.2
16761	7	IC	22.5-25.0	4.2
16760	8	IC	12-15	4.0
16759	9	IA	5-8	3.6

16721	10	IC/ Intrusion	30-33.5	4.4

EU 233 - South Wall   Water pH - 4.5   Water Temp - 27 c

Cat #	Sample #	Horizon	Depth Range (cm BS)	pH
16774	1	IIB	59-62	3.65
16773	2	IIB	48-51	4.0
16772	3	IIB	37-40	4.2
16771	4	IIA	31-33	4.1
16770	5	IIA	26.5-28.5	4.1
16732	6	IIA	24-26.5	4.15
16769	7	IC	19-21	4.1
16768	8	IC	11-14.5	3.5
16730	9	IA	3-5.5	3.65
16731	10	IC/ Intrusion	30-33	4.25

APPENDIX 2

Radiocarbon Date

Provenience: 134-00-025 Concentration: 281

Age (Lab No.): 1090±80 BP (I-13, 692)(C-13=-0.44o/oo)

Material: 32.8 g mixed shell fragments; species include *Mercenaria mercenaria*, *Crassostrea virginica*, *Mya arenaria*, and *Spisula solidissima*

Source: General excavation

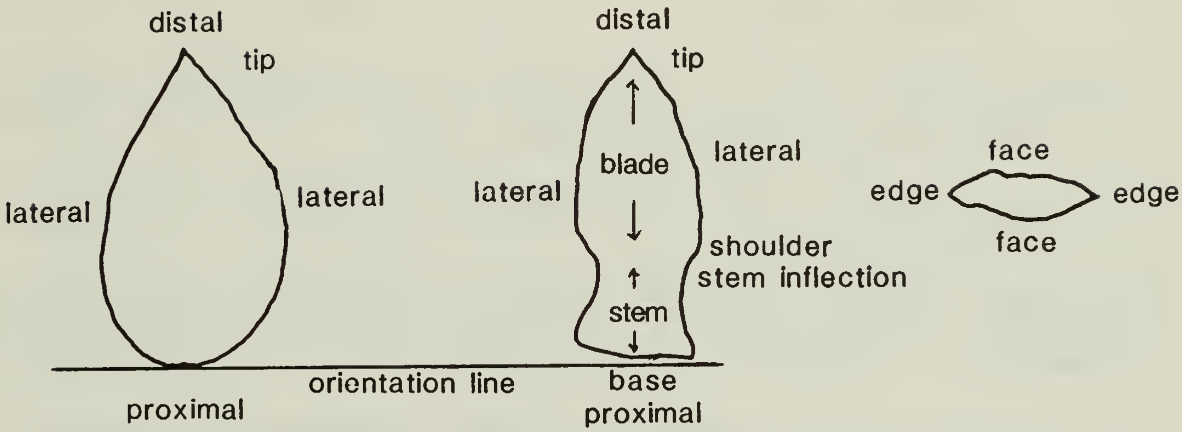
Context and Associations: Stratigraphy in this unit consists of a 20 cm thick aeolian sand (Stratum I) layer overlying the paleosol. The IIA horizon is about 10 cm thick, and the shell sample comes from the lower 5 cm excavation level in this horizon. I-13, 692 is all shell recovered from this provenience, and this is the largest single sample of shell recovered from the site.

Artifacts from the excavation unit comprise lithic debitage, fire-cracked rock, and calcined bone fragments. Twenty-eight of the 29 lithics are quartz, and the peak density of lithics occurs in Level 025. Level 035 produced a stemmed biface with side notches that is classified in the miscellaneous group.

The sample was dated because it is the only substantial amount of organic material from the site. It does not come from a feature context, and its depth in the IIA horizon suggest it may be plow-disturbed. The radiocarbon date is clearly too late to refer to the quartz assemblage from the site; it may date the minor component represented by the ceramics and possibly most of the shell.

Biface Measurement System

Morphology



Non-stemmed biface (plan)

Stemmed biface (plan)

All bifaces (cross-section)

Cross-section - Plane perpendicular to the faces of the biface and intersecting the faces parallel to the orientation line.

Longitudinal section - Plane perpendicular to the faces of the biface and intersecting the faces perpendicular to the orientation line.

Stem inflection - Point along edge of biface stem proximal of shoulder where outline changes from concave up to concave down. The stem inflection is equivalent to the shoulder if no change from concave up to concave down can be recognized.

Non-Stemmed Bifaces

Orientation: Parallel to the proximal (widest) end. If convex, tangent to the most proximal point on the biface.

Maximum length - Distance between orientation line and tip perpendicular to orientation line.

Maximum width - Distance between most widely separated pair of points on opposite lateral edges parallel to orientation line.

Maximum thickness - Greatest cross-section width parallel to orientation line.

Stemmed bifaces

Orientation: Parallel to the base (if convex, tangent to most proximal point on base; if concave, the line between the most proximal points on the base).

Maximum length - Distance between base and tip perpendicular to orientation line.

Maximum width - Distance between most widely separated pair of points on opposite lateral edges parallel to orientation line.

Maximum thickness - Greatest cross-section width parallel to orientation line.

Base width - Distance between stem-base junctures on lateral edges parallel to orientation line.

Stem width - Distance between stem inflections parallel to orientation line.

Shoulder width - Distance between shoulders perpendicular to orientation line.

Stem height - Distance between orientation line and more distal of stem inflection points.

Shoulder height - Distance between orientation line and more distal of shoulders.

Stem thickness - Cross-section thickness at more distal of stem inflection points parallel to orientation line.

Shoulder thickness - Cross-section thickness at more distal of shoulders parallel to orientation line.

Note that the greater of stem height is equivalent to the stem length measurement of the Massachusetts Historical Commission (Johnson and Mahlstedt 1984).

Descriptive terms for cross section, longitudinal section, blade shape, and base shape follow Binford (1963).

APPENDIX 4

Biface Measurements

Notes on the Tables

In Table A4.1, weight is given in grams. Material codes (MATL CODE) are as follows: 110-quartz, 120-flesite, 123-weathered felsic volcanic, 126-fine-grained felsic volcanic, 130-quartzite; definitions are in Borstel (1984c:15.6). The classification of bifaces is listed in BifClass. Groups 1-3 are 1., 2., and 3.; 4. refers to fragments and miscellaneous bifaces. The decimal portions of these codes refer to the A(.1), B(.2), C(.3), and D(.4) subgroups. Fragment codes are as follows: 0-complete; 10-fragmentary, 13-proximal, 14-distal, 15-medial, 16-lateral.

In Table A4.2, material codes (MATL CODE) are as given above. Fragment codes (PORTION) are: 0-complete, 1-fragmentary. The classification of the stemmed bifaces is given under TYPE CODE as follows: 1-Group 1 (Cape Stemmed), 2-Groups 2 (Wading River), 3-Groups 3 (Squibnocket Stemmed), 4-Miscellaneous. The decimal portions of the codes for Groups 2 and 3 refer to the cross-classification of these bifaces in the Massachusetts Historical Commission's typology of small stemmed points (Johnson and Mahlstedt 1984:86-95): .1-small stemmed I, .2-small stemmed II, .3-small stemmed III, .4-small stemmed IV.

TABLE A4.1

Non-Stemmed Biface Attributes

CAT NO	EU	LEVEL	MAX L (mm)	MAX W (mm)	MAX T (mm)	WEIGHT	MATL CODE	BifClass	Fragment
16172	198	0.00	m.v.	37.80	14.80	23.04	120	1.10	10.00
16173	2012	0.00	m.v.	m.v.	m.v.	22.92	110	1.10	10.00
16183	202	10.00	m.v.	47.00	19.40	21.91	110	1.10	10.00
16203	2052	20.00	40.50	21.20	12.00	14.99	110	1.10	14.00
16222	208	15.00	m.v.	m.v.	m.v.	6.24	110	1.10	13.00
16230	209	15.00	m.v.	27.80	15.30	15.34	110	1.10	15.00
16234	210	0.00	m.v.	30.60	14.10	16.41	120	1.10	15.00
16287	216	10.00	44.40	22.40	14.30	17.37	110	1.10	0.00
16315	218	10.00	m.v.	24.20	12.00	10.20	110	1.10	14.00
16341	220	10.00	m.v.	31.80	17.50	21.20	110	1.10	13.00
16382	2251	0.00	m.v.	31.20	17.00	16.22	123	1.10	14.00
16410	228	15.00	54.10	26.80	15.60	26.48	110	1.10	0.00
16421	229	15.00	58.80	30.50	23.20	43.78	110	1.10	0.00
16459	211	10.00	m.v.	41.80	24.10	35.48	110	1.10	10.00
16202	204	10.00	m.v.	27.50	8.40	11.20	126	1.20	13.00
16211	206	10.00	m.v.	21.00	10.00	11.04	110	1.20	14.00
16342	220	15.00	m.v.	26.30	9.10	15.67	130	1.20	10.00
16354	222	15.00	m.v.	28.70	12.00	17.74	110	1.20	14.00
16373	223	20.00	m.v.	26.10	12.20	14.42	120	1.20	13.00
16379	224	20.00	m.v.	22.30	9.20	10.27	120	1.20	14.00
16405	2274	25.00	56.70	25.70	11.50	13.68	126	1.20	0.00
16409	228	15.00	45.80	23.70	13.20	12.64	126	1.20	0.00
16439	231	25.00	m.v.	27.60	13.30	16.34	110	1.20	13.00
16443	232	15.00	m.v.	24.20	11.10	9.75	110	1.20	13.00
16182	202	10.00	m.v.	20.00	10.00	7.15	110	1.30	14.00
16214	207	5.01	64.80	25.40	11.30	19.88	110	1.30	0.00
16264	2132	15.00	m.v.	21.80	8.40	4.67	110	1.30	14.00
16272	214	10.00	m.v.	19.20	6.40	3.66	126	1.30	14.00
16275	214	15.00	57.70	23.00	11.20	15.20	120	1.30	0.00
16286	216	0.00	m.v.	23.00	11.70	12.96	126	1.30	10.00
16302	217	15.00	m.v.	m.v.	m.v.	1.83	110	1.30	15.00
16321	218	10.00	40.20	20.80	11.00	8.27	120	1.30	0.00
16324	218	15.00	m.v.	m.v.	m.v.	2.05	110	1.30	15.00
16328	219	0.00	32.30	m.v.	m.v.	1.98	110	1.30	16.00
16348	222	5.00	m.v.	17.40	8.70	5.16	110	1.30	15.00
16353	222	15.00	m.v.	m.v.	m.v.	4.92	110	1.30	14.00
16362	223	10.00	m.v.	25.40	9.60	6.79	126	1.30	10.00
16383	2251	10.00	m.v.	19.50	18.90	3.96	110	1.30	13.00
16389	2254	15.00	m.v.	22.20	11.30	8.76	126	1.30	13.00
16448	232	25.00	42.30	16.60	8.90	5.91	110	1.30	0.00
16468	2014	15.00	m.v.	22.10	11.10	6.85	110	1.30	13.00
16171	197	0.00	44.90	26.50	15.10	19.80	110	2.10	10.00
16193	203	15.00	m.v.	38.20	17.80	27.09	110	2.10	13.00
16261	2132	0.00	m.v.	33.00	14.10	24.09	120	2.10	13.00
16343	2212	10.00	58.10	34.30	22.10	48.43	110	2.10	0.00
16216	207	10.00	m.v.	32.60	11.90	8.30	110	2.20	14.00
16237	210	10.00	m.v.	15.30	32.00	9.00	110	2.20	14.00
16375	223	20.00	m.v.	37.00	14.50	18.41	110	2.20	13.00
16393	226	5.00	m.v.	41.00	15.30	22.60	110	2.20	14.00
16464	211	15.00	m.v.	34.00	13.50	20.90	110	2.20	10.00

TABLE A4.1
(Continued)

CAT NO	EU	LEVEL	MAX L (mm)	MAX W (mm)	MAX T (mm)	WEIGHT	MATL CODE	BifClass	Fragment
16191	203	10.00	m.v.	28.70	13.20	20.09	110	2.30	13.00
16195	203	15.00	m.v.	27.30	14.40	5.46	110	2.30	14.00
16229	209	15.00	45.00	24.00	12.10	13.57	110	2.30	0.00
16300	217	15.00	m.v.	31.00	11.00	7.17	110	2.30	14.00
16396	226	15.00	45.70	29.60	14.30	20.10	110	2.30	0.00
16420	229	15.00	51.30	28.20	11.80	16.00	110	2.30	0.00
16440	231	25.00	48.00	28.70	14.80	19.39	110	2.30	0.00
16180	202	0.00	60.20	m.v.	m.v.	13.76	110	2.40	16.00
16190	203	10.00	49.20	30.10	11.50	16.33	110	2.40	0.00
16207	206	10.00	58.30	37.80	14.80	30.78	110	2.40	0.00
16231	209	15.00	m.v.	23.30	9.10	7.71	110	2.40	14.00
16283	215	15.00	48.80	28.80	11.20	15.04	110	2.40	0.00
16288	216	10.00	m.v.	m.v.	8.30	7.77	110	2.40	14.00
16336	219	20.00	49.70	m.v.	m.v.	11.13	110	2.40	16.00
16376	223	0.00	m.v.	38.40	9.10	10.86	120	2.40	14.00
16381	224	20.00	56.00	32.90	10.70	8.46	110	2.40	0.00
16388	2253	15.00	50.20	32.20	10.30	20.55	110	2.40	0.00
16434	230	20.00	54.10	m.v.	17.00	17.69	110	2.40	16.00
16450	233	15.00	63.30	33.00	13.00	21.97	120	2.40	0.00
16451	233	15.00	59.00	35.50	12.00	21.42	120	2.40	0.00
16177	2011	10.00	m.v.	51.00	22.00	52.16	110	3.10	10.00
16263	2132	15.00	52.20	m.v.	20.70	32.25	110	3.10	10.00
16340	220	10.00	71.50	58.50	32.20	132	110	3.10	0.00
16387	2252	15.00	m.v.	43.70	17.30	27.98	110	3.10	10.00
16432	230	0.00	57.80	39.00	18.30	48.10	120	3.10	0.00
16453	198	0.00	m.v.	41.20	24.50	47.62	110	3.10	10.00
16460	211	10.00	57.00	39.40	23.30	44.89	110	3.10	10.00
16463	211	15.00	m.v.	50.40	18.30	41.21	110	3.10	10.00
16179	2011	10.00	m.v.	39.50	19.60	32.83	110	3.20	10.00
16181	202	5.00	m.v.	45.20	18.40	37.03	110	3.20	10.00
16185	202	10.00	30.50	20.80	9.60	5.77	110	3.20	0.00
16243	210	15.00	m.v.	35.50	13.40	15.57	110	3.20	10.00
16267	2132	15.00	m.v.	48.00	15.00	22.87	120	3.20	10.00
16271	214	10.00	m.v.	35.30	19.30	34.86	130	3.20	10.00
16277	214	15.00	39.60	36.00	14.50	16.10	110	3.20	0.00
16291	216	15.00	m.v.	26.90	17.10	40.32	120	3.20	10.00
16318	218	10.00	m.v.	25.00	12.80	9.28	110	3.20	10.00
16327	218	30.00	42.50	32.80	20.50	24.92	110	3.20	10.00
16357	222	25.00	45.40	41.20	21.00	33.64	110	3.20	0.00
16363	223	10.00	m.v.	m.v.	11.80	19.45	126	3.20	10.00
16364	223	15.00	m.v.	27.50	15.00	15.33	110	3.20	13.00
16366	223	15.00	m.v.	51.20	16.90	36.39	110	3.20	10.00
16178	201	10.00	m.v.	26.20	8.60	6.40	110	4.00	15.00
16184	202	10.00	m.v.	40.00	15.60	15.69	110	4.00	15.00
16194	203	15.00	m.v.	m.v.	m.v.	8.54	110	4.00	15.00
16196	203	15.00	m.v.	m.v.	m.v.	4.00	110	4.00	15.00
16201	204	10.00	54.10	41.50	24.00	72.93	110	4.00	0.00

TABLE A4.1
(Continued)

CAT NO	EU	LEVEL	MAX L (mm)	MAX W (mm)	MAX T (mm)	WEIGHT	MATL CODE	BifClass	Fragment
16213	207	5.00	m.v.	m.v.	m.v.	8.34	110	4.00	15.00
16221	208	10.00	m.v.	m.v.	m.v.	12.01	110	4.00	14.00
16223	208	20.00	63.40	m.v.	28.00	37.84	110	4.00	15.00
16226	209	0.00	m.v.	41.70	19.00	25.59	110	4.00	15.00
16257	212	15.00	m.v.	m.v.	m.v.	4.72	110	4.00	14.00
16262	2131	10.00	m.v.	m.v.	m.v.	3.46	130	4.00	15.00
16268	2133	25.00	m.v.	m.v.	m.v.	2.97	110	4.00	13.00
16292	216	15.00	m.v.	m.v.	m.v.	18.21	120	4.00	14.00
16301	217	15.00	m.v.	m.v.	m.v.	.53	110	4.00	14.00
16309	218	10.00	42.20	m.v.	17.40	11.09	110	4.00	15.00
16313	218	10.00	m.v.	31.10	13.10	10.31	110	4.00	15.00
16314	218	10.00	m.v.	m.v.	m.v.	6.42	110	4.00	13.00
16317	218	10.00	m.v.	m.v.	m.v.	5.48	110	4.00	14.00
16322	218	10.00	m.v.	30.00	11.20	19.66	123	4.00	15.00
16326	218	20.00	m.v.	m.v.	m.v.	4.56	120	4.00	15.00
16332	219	10.00	m.v.	m.v.	m.v.	11.51	110	4.00	15.00
16350	222	10.00	44.00	28.50	18.20	24.98	110	4.00	0.00
16352	222	15.00	m.v.	23.30	11.10	9.43	110	4.00	14.00
16355	222	10.00	m.v.	25.00	13.20	12.07	110	4.00	13.00
16365	223	15.00	m.v.	34.20	11.70	12.80	110	4.00	15.00
16367	223	15.00	m.v.	m.v.	m.v.	12.60	110	4.00	15.00
16369	223	15.00	m.v.	m.v.	m.v.	2.59	110	4.00	14.00
16384	2252	10.00	m.v.	m.v.	m.v.	8.54	110	4.00	15.00
16385	2251	15.00	m.v.	m.v.	m.v.	9.73	110	4.00	14.00
16386	2252	15.00	m.v.	m.v.	m.v.	2.75	110	4.00	14.00
16398	226	15.00	m.v.	m.v.	m.v.	1.86	110	4.00	14.00
16404	2274	20.00	m.v.	28.30	12.10	18.78	120	4.00	14.00
16407	228	10.00	m.v.	21.80	12.30	8.60	110	4.00	13.00
16408	228	15.00	64.00	43.40	22.60	48.35	126	4.00	10.00
16414	228	25.00	m.v.	m.v.	m.v.	1.06	110	4.00	14.00
16415	229	0.00	35.00	26.00	11.10	10.08	110	4.00	0.00
16418	229	15.00	m.v.	m.v.	m.v.	11.29	110	4.00	15.00
16419	229	15.00	m.v.	32.30	18.70	22.64	110	4.00	15.00
16424	229	15.00	m.v.	m.v.	m.v.	8.36	110	4.00	15.00
16438	231	10.00	m.v.	m.v.	m.v.	6.20	110	4.00	15.00
16455	2054	15.00	m.v.	32.00	11.50	5.44	110	4.00	15.00
16461	211	10.00	m.v.	27.30	14.00	9.52	110	4.00	15.00
16462	211	10.00	m.v.	m.v.	m.v.	1.36	120	4.00	14.00
16701	226	15.00	m.v.	m.v.	m.v.	8.95	126	4.00	14.00
16702	2012	10.00	m.v.	m.v.	m.v.	9.11	110	4.00	13.00

TABLE A4.2

Ste[redacted]ed Biface Attributes

CAT NO	EU	LEVEL	MAX L (mm)	MAX W (mm)	MAX T (mm)	SHLDRH(mm)	SHLDRW(mm)	SHLDRT(mm)	STEM H(mm)
16186	202	20.00	m.v.	21.50	9.60	21.00	21.50	9.40	4.00
16200	204	5.00	m.v.	22.50	8.10	m.v.	m.v.	m.v.	6.00
16210	206	10.00	65.40	30.20	14.60	42.00	30.20	12.70	23.00
16219	207	10.00	m.v.	19.00	9.00	m.v.	m.v.	m.v.	m.v
16250	211	20.00	37.30	22.00	11.40	19.00	22.00	10.10	9.00
16252	212	0.00	m.v.	25.20	9.80	m.v.	m.v.	m.v.	10.00
16253	212	5.00	35.40	19.60	8.40	20.00	19.20	8.20	20.00
16281	215	10.00	m.v.	21.70	12.50	m.v.	m.v.	m.v.	10.00
16290	216	15.00	m.v.	19.00	7.50	16.00	m.v.	m.v.	15.00
16295	217	10.00	m.v.	24.60	13.20	33.00	24.60	13.20	12.00
16297	217	15.00	m.v.	23.60	11.20	m.v.	m.v.	m.v.	8.00
16345	2212	20.00	m.v.	24.60	12.00	20.00	m.v.	m.v.	12.00
16351	222	10.00	m.v.	22.50	10.60	m.v.	m.v.	m.v	6.00
16378	224	10.00	m.v.	24.70	9.00	m.v.	m.v.	m.v.	8.00
16380	224	20.00	46.30	25.10	9.90	23.00	25.10	9.90	9.00
16394	226	15.00	m.v.	23.00	11.40	27.00	23.00	11.00	9.00
16395	226	15.00	38.30	24.80	8.60	23.00	22.80	8.60	9.00
16402	2272	5.00	37.00	21.00	10.20	18.00	21.00	9.40	5.00
16403	2272	20.00	36.50	20.50	10.30	22.00	19.50	8.20	9.00
16417	229	10.00	30.00	23.30	9.80	20.00	23.30	9.80	6.00
16454	2053	5.00	m.v.	26.40	9.30	m.v.	26.40	9.30	m.v.
16192	203	15.00	m.v.	12.80	7.10	m.v.	m.v.	m.v.	m.v.
16218	207	10.00	m.v.	m.v.	m.v.	14.00	m.v.	m.v.	12.00
16225	208	20.00	34.30	17.40	6.50	15.00	17.40	6.00	13.00
16227	209	10.00	36.00	18.10	6.70	14.00	18.10	6.70	12.00
16233	210	0.00	28.90	18.90	7.80	10.00	18.90	7.00	7.00
16240	210	15.00	39.00	17.30	7.20	18.00	16.90	7.00	14.00
16248	211	10.00	m.v.	16.00	5.90	10.00	15.30	5.20	9.00
16254	212	10.00	38.00	17.80	7.50	15.00	17.30	6.30	13.00
16306	218	10.00	m.v.	17.50	7.50	14.90	16.50	7.40	12.00
16307	218	10.00	m.v.	18.30	7.80	12.00	18.30	7.80	10.00
16346	2213	30.00	43.70	19.00	9.80	15.00	18.70	9.80	13.00
16349	222	10.00	32.90	17.40	6.70	12.00	16.90	6.00	6.00
16371	223	15.00	45.00	19.50	8.90	12.00	18.90	8.90	10.00
16175	2011	5.00	32.50	16.20	8.60	18.00	16.20	7.70	18.00
16187	203	5.00	20.00	10.70	4.60	12.00	10.70	4.00	8.00
16176	2011	10.00	67.30	28.30	7.70	19.00	26.30	6.40	6.00
16284	215	15.00	48.50	31.00	6.60	10.00	29.00	5.60	10.00
16390	2254	15.00	54.90	18.60	11.00	m.v.	m.v.	m.v.	7.00
16449	233	10.00	50.00	15.80	8.60	23.00	15.80	8.60	6.00

CAT NO	STEM W(mm)	STEM T(mm)	BASE W(mm)	WEIGHT(g)	MATL CODE	PORTION	TYPE CODE
16186	17.20	5.50	19.00	8.42	110	0.00	1.00
16200	20.40	7.30	22.50	3.07	110	0.00	1.00
16210	24.20	12.80	24.40	30.46	110	1.00	1.00
16219	m.v.	m.v.	m.v.	4.01	110	0.00	1.00
16250	19.50	9.50	20.50	9.75	110	1.00	1.00
16252	19.20	9.60	25.20	8.47	110	0.00	1.00
16253	19.20	8.20	19.40	7.53	110	1.00	1.00
16281	18.20	10.00	21.70	4.81	110	0.00	1.00
16290	m.v.	m.v.	18.70	2.65	110	0.00	1.00
16295	18.60	11.40	21.90	11.57	110	0.00	1.00
16297	22.00	8.00	23.60	10.86	110	0.00	1.00
16345	21.60	12.00	24.60	5.16	110	0.00	1.00
16351	19.80	8.90	22.50	5.66	110	0.00	1.00
16378	21.40	8.00	24.70	5.70	120	0.00	1.00
16380	19.50	8.00	22.00	12.66	126	1.00	1.00
16394	21.20	9.20	24.50	10.22	110	0.00	1.00
16395	22.30	8.30	24.80	8.61	110	1.00	1.00
16402	19.30	6.40	21.00	8.56	110	0.00	1.00
16403	18.00	8.50	20.50	7.88	110	1.00	1.00
16417	19.30	8.10	21.60	7.99	110	1.00	1.00
16454	19.30	8.30	m.v.	3.27	110	0.00	1.00
16192	m.v.	m.v.	11.60	.98	110	0.00	2.01
16218	m.v.	m.v.	m.v.	2.32	110	0.00	2.03
16225	14.20	5.90	14.20	3.71	110	1.00	2.03
16227	13.70	6.50	14.20	4.42	110	1.00	2.03
16233	12.30	5.60	13.00	3.52	110	1.00	2.02
16240	7.80	6.00	12.30	5.19	110	1.00	2.02
16248	12.00	5.20	12.40	2.69	110	0.00	2.03
16254	12.40	6.00	12.30	5.00	110	0.00	2.01
16306	13.60	6.80	13.70	4.18	110	0.00	2.03
16307	13.00	11.40	12.30	2.56	110	0.00	2.03
16346	15.10	9.20	14.70	7.45	110	1.00	2.04
16349	11.40	6.00	11.10	4.05	110	1.00	2.02
16371	12.90	8.70	11.70	6.66	110	1.00	2.02
16175	16.20	7.70	8.00	3.86	110	1.00	3.04
16187	9.10	3.70	8.00	.95	110	1.00	3.00
16176	20.00	5.90	19.00	17.42	126	1.00	4.00
16284	29.00	5.60	31.00	8.22	126	1.00	4.00
16390	16.00	5.90	18.80	10.86	126	1.00	4.00
16449	12.30	5.70	13.00	6.36	126	1.00	4.00

Variable # 17 has been deleted, 28 variables remain.

A Speculative Image of 19BN281

Often the archeologist arrives at the end of an analytical cycle, having established certain notions with greater or lesser confidence, but without having brought these together to form a vivid whole. The following is an effort to draw such a picture of the site. It makes only a minimal claim to veracity, although everywhere it has sought to be plausible, based on the evidence recovered from the site.

* * *

More than four millenia ago, people of the Squibnocket complex came to camp in the pitch pine-oak woodland of Pilgrim Heights. They may have come by sea, plying Massachusetts Bay in dugout canoes, or they may have walked in along trails already many centuries old. Their camping place was soon familiar to them, for they came often, but their visits never lasted more than a few weeks.

At their camp, the Squibnocket people built simple shelters with sapling frameworks covered by mats or skins. Their shelters were quickly constructed and easily vacated. Around the camp they cooked wherever it was convenient -- sometimes indoors, sometimes out, rearranging used rocks and building hearths afresh to suit the most current need. Sometimes they cooked by pot boiling and at other times by roasting, always using woods that burned to ash.

Their material possessions were varied, but mostly perishable once discarded. While at camp, they made and repaired items of wood, bone, skin, and fiber. Some of their tools were stone, and for stone tools they nearly always used quartz. In this, these ancient Cape Codders were like their fellow peoples throughout southern New England, who just then disdained all other kinds of rocks. The people of this camp at High Head gathered these raw materials as stones on nearby beaches. These they brought back to camp and shaped into tools. Some tools were simply made by removing a few flakes from a pebble, but others demanded considerable skill and some small investment of time. While at camp the tool makers also resharpened the dulled tools and took the old or broken ones from their hafts for discard. The tool makers worked in no special place, just where the company was good or where the ground was dry or

where the air was warm and bright. The wastage from stone chipping was everywhere about the camp, and, along with the fire-broken rocks from last season's hearths, passing feet quickly pressed the debris into the forest floor.

Their projectiles were javelins tipped with small stone points, and many of the Squibnocket people carried at least one stout chipped stone knife. The knives had wooden handles with stems tightly bound in hafts that reached to the base of the blade. Only the people of the curving land by the great salt water made these knives, not the others who lived back from the sea.

Hunters went out from camp, returning with deer and other game. And down the scarp to the shore some people went, to fish in the bay or in the quiet cove between the headland and the spit. They used gear which they kept in repair at camp. To weight the gear the people used plummet stones, tied by means of a cord around the neck. Perhaps they cast or perhaps they seined or perhaps, like the people of Shawmut, across the bay to the northwest, they had weirs at the edge of the salt marsh. They brought back fish of many kinds to cook and eat at camp, but rarely consumed shellfish there.

The years cycled many times and the people returned again and again. Then they came no more. Perhaps their way of life changed or it maybe that they were replaced by newcomers who didn't care for the camp back from the shore. The air was quieter now, filled only with forest sounds. No longer was the camp site alive with the crack of stoneworking, the laughter from the storyteller, or the smell of woodsmoke and cooked venison.

REFERENCES CITED

Altpeter, L. Sanford
1937 History of the Forests of Cape Cod. Ms. on file, Headquarters, Cape Cod National Seashore, South Wellfleet, Massachusetts.

Barber, Russell R.
1981 Quartz Technology at the Sassafras Site, A Prehistoric Quarry-Workshop. In Quartz Technology in Prehistoric New England, edited by Russell R. Barber, pp. 49-62. Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, Massachusetts.

Barnes, Ruth Carol
1972 Bear Swamp 2: A Preliminary Report. PhD. dissertation, University of Pennsylvania. No. 72-25,537, University Microfilms, Ann Arbor, Michigan.

Binford, Lewis R.
1963 A Proposed Attribute List for the Description and Classification of Projectile Points. In Miscellaneous Studies in Typology and Classification, pp. 193-221. Anthropological Papers No. 19. Museum of Anthropology, University of Michigan, Ann Arbor.

Borstel, Christopher L.
1982 Archaeological Investigations at the Young Site, Alton, Maine. Occasional Publications in Maine Archaeology No. 2. Maine Historic Preservation Commission, Augusta.

1984a Stratigraphy and Archeological Context of Prehistoric Sites at Cape Cod National Seashore. In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 181-229. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984b Prehistoric Site Chronology: A Preliminary Report.

In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 231-313. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984c Stones for Tool-Making: Local Resources and Archeological Observations. In Chapters in the Archeology of Cape Cod, I, vol. 2, edited by Francis P. McManamon, pp. 277-337. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Brennan, Louis A.
1977 The Lower Hudson: The Archaic. In Amerinds and Their Paleoenvironments in Northeastern North America, edited by Walter S. Newman and Bert Salwen, pp. 411-430. Annals, Vol. 288. New York Academy of Sciences, New York.

Childs, S. Terry
1984 Prehistoric Ceramic Remains. In Chapters in the Archeology of Cape Cod, I, vol. 2, edited by Francis P. McManamon, pp. 195-274. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Clemenson, Berle
1979 Historic Resource Study: Cape Cod National Seashore, Massachusetts. Historic Preservation Division, Denver Service Center, National Park Service, Denver.

Crabtree, Don E.
1972 An Introduction to Flintworking. Occasional Papers No. 20. Idaho State University Museum, Pocatello.

Dickson, F.P.
1981 Australian Stone Hatchets. Academic Press, New York.

Dincauze, Dena F.
1972 The Atlantic Phase: A Late Archaic Culture in Massachusetts. Man in the Northeast 4:40-61.

1974 An Introduction to Archaeology in the Greater Boston Area. Archaeology of Eastern North America 2:39-67.

1976 The Neville Site: 8,000 Years at Amoskeag, Manchester, New Hampshire. Peabody Museum Monographs No. 4. Harvard University Press, Cambridge, Massachusetts.

Dunnell, Robert C.
1971 Systematics in Prehistory. Free Press, New York.

Fitzgerald, Joyce
1984 Fort Hill 1983: Excavations at 19BN308 Concentration 33. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Folk, Robert L.
1974 Petrology of Sedimentary Rocks. Hemphill, Austin, Texas.

Funk, Robert E.
1976 Recent Contributions to Hudson Valley Prehistory. Memoir 22. New York State Museum, Albany.

Goggin, John M.
1949 Cultural Traditions in Florida Prehistory. In The Florida Indian and His Neighbors, edited by J.W. Griffin, pp. 13-44. Inter-American Center, Rollins College, Winter Park, Florida.

Gould, Richard A. and Sherry Saggers
1985 Lithic Procurement in Central Australia: A Closer Look at Binford's Idea of Embeddedness in Archaeology. American Antiquity 50: 117-136.

Hancock, Mary E.
1984 Shellfish Distribution on Prehistoric Archeological Sites, Outer Cape Cod. In Chapters in the Archeology of Cape Cod, I, vol. 2, edited by Francis P. McManamon, pp. 83-120. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Hartwig, Frederick and Brian E. Dearing
1979 Exploratory Data Analysis. Quantative Applications in the Social Siences 16. Sage Publication Beverly Hills, California.

Hays, William L.
1973 Statistics for the Social Sciences. Holt, Rinehart, and Winston, New York.

Johnson, Eric S. and Thomas F. Mahlstedt
1984 Guide to Prehistoric Site Files and Artifact Classification System. Massachusetts Historical Commission, Boston.

Kalin, Jeffrey
1981 Stem Point Manufacture and Debitage Recovery. Archaeology of Eastern North America 9:134-175.

Koteff, Carl, R.N. Oldale, and J.H. Hartshorn
1967 Geological Map of the North Truro Quadrangle, Barnstable County, Massachusetts (1:24000). Geological Quadrangle Maps of the United States, Map GQ-599. U.S. Geological Survey, Washington, D.C.

Krumbein, W.C.
1934 Size Frequency Distribution of Sediments. Journal of Sedimentary Petrology 4:65-77.

eatherman, Stephen P. and Paul J. Godfrey
1979 Environmental Effects of Dune Mining, Mount Ararat, The Province Lands. In Environmental Geologic Guide to Outer Cape Cod, edited by Stephen P. Leatherman, pp. 223-232. Field Trip Guide Book for the Eastern Section of the Society of Economic Paleontologists and Mineralogists. University of Massachusetts-National Park Service Cooperative Research Unit, Amherst.

Loy, Thomas H.
1983 Prehistoric Blood Residues: Detection on Tool Surfaces and Identification of Species of Origin. Science 220:1269-1271.

Mahlstedt, Thomas
1985 Prehistoric Overview. In Historic and Archaeological Resources of the Cape and the Islands. Boston, Massachusettes Historical Commission, in press.

McCaffrey, Cheryl and Stephen P. Leatherman
1979 Historical Land Use Practices and Dune Instability in the Province Lands. In Environmental Geologic Guide to Outer Cape Cod, edited by Stephen P. Leatherman, pp. 207-222. Field Trip Guide Book for the Eastern Section of the Society of Economic Paleontologists and Mineralogists. University of Massachusetts-National Park Service Cooperative Research Unit, Amherst.

McManamon, Francis P.
1982 Prehistoric Land Use on Outer Cape Cod. Journal of Field Archaeology 9:1-20.

1984a Project Goals, History and Products. In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 1-23. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984b Methods and Techniques for Survey and Site Examination. In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 25-44. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984c Geographical Orientation and Intrasite Units of Analysis. In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 45-94. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984d Types of Archeological Deposits and Lithic Assemblage Analysis. In Chapters in the Archeology of Cape Cod, I, vol. 2, edited by Francis P. McManamon, pp. 1-42. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1984e Prehistoric Cultural Adaptations and their Evolution on Outer Cape Cod. In Chapters in the Archeology of Cape Cod, I, vol. 2, edited by Francis P. McManamon, pp. 339-417. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

--------- (editor)
1984 Chapters in the Archeology of Cape Cod, I (2 vols.). Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

McManamon, Francis P. and Christopher L. Borstel
1984 The Natural Environment and Natural Resources. In Chapters in the Archeology of Cape Cod, I, vol. 1, edited by Francis P. McManamon, pp. 95-115. Cultural Resources Management Study No. 8. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

McMillan, Barbara Ann
1977 The Shawnee Minisink Site: A Technological Analysis of the Early Archaic. Ph.D. dissertation, The American University. No. 77-27441, University Microfilms, Ann Arbor.

Moffett, Ross
1944 Materials Used for Chipped Implements. Bulletin of the Massachusetts Archaeological Society 5: 42-47.

1957 A Review of Cape Cod Archaeology. Bulletin of the Massachusetts Archaeological Society 19:1-19.

1959 Notes on the Small's Swamp Shell Heap, Truro, Massachusetts. Bulletin of the Massachusetts Archaeological Society 21:1-14.

1962 Notes on the Archaeological Survey for the National Park Service. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Nance, Jack D.
1981 Statistical Fact and Archaeological Faith: Two Models in Small Site Sampling. Journal of Field Archaeology 8:151-165.

Nelson, Lee H.
1968 Nail Chronology as an Aid to Dating Old Buildings. Technical Leaflet 48. American Association for State and Local History, Nashville, Tennessee.

O'Donnell, Patricia A. and Stephen P. Leatherman
1980 Generalized Maps and Geomorphic Reconstruction of Outer Cape Cod Between 12,000 B.P. and 500 B.P. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Oldale, Robert N.
1969 Seismic Investigations on Cape Cod, Martha's Vineyard, and Nantucket, Massachusetts, and a Topographic Map of the Basement Surface from Cape Cod Bay to the Islands. U.S. Geological Survey Professional Paper 650-B:B122-B127.

1976 Notes on the Generalized Geologic Map of Cape Cod. Open File Report 76-765. U.S. Geological Survey, Woods Hole, Massachusetts.

1982 Pleistocene Stratigraphy of Nantucket, Martha's Vineyard, the Elizabeth Islands, and Cape Cod, Massachusetts. In Late Wisconsinan Glaciation of New England, edited by G.J. Larson and B.D. Stone, pp. 1-34. Kendall/Hunt, Dubuque, Iowa.

Oldale, Robert N. and Charles J. O'Hara
1980 New Radiocarbon Dates from the Inner Continental Shelf off Southeastern Massachusetts and a Local Sea-level-rise Curve for the Past 12,000 yr. Geology 8:102-106.

Peech, Michael
1965 Hydrogen-Ion Activity. In Methods of Soil Analysis, edited by C.A. Black, pp. 914-926. No. 9 in the series Agronomy. American Society of Agronomy, Madison, Wisconsin.

Poppe, L.J., A. Eliason and J.J. Fredericks
1985 APSAS: An Automated Particle Size Analysis System. Circular 963. U.S. Geological Survey, Washington, D.C.

Pryor, Wayne
1971 Grain Shape. In Procedures in Sedimentary Petrology, edited by R.E. Carver, pp. 131-150. Wiley-Interscience, New York.

Redfield, A.C. and M. Rubin
1962 The Age of Salt Marsh Peat and Its Relation to Recent Changes in Sea Level at Barnstable, Massachusetts. Proceedings of the National Academy of Science 48:1728-1735. Washington, D.C.

Redman, Charles L.
1974 Archaeological Sampling Strategies. Addison-Wesley Modules in Anthropology 55. Addison-Wesley, Reading, Massachusetts.

Redman, Charles L. and Ronald D. Anzalone
1980 Discovering Architectural Patterning at a Complex Site. American Antiquity 45:284-290.

Richardson, James B., III
1983 Prehistory and Paleoenvironments on Martha's Vineyard: Some Preliminary Observations. Paper presented at the 48th Annual Meeting of the Society for American Archaeology, Pittsburgh.

Ritchie, Duncan
1981 Quartz Reduction Sequence from Small Stemmed Point Contexts in the Taunton Basin, South Eastern Massachusetts. In Quartz Technology in Prehistoric New England, edited by Russell R. Barber, pp. 49-62.

Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, Massachusettes.

Ritchie, William A.
1969a The Archaeology of New York State, 2d. rev. ed. Natural History Press, Garden City, New York.

1969b The Archaeology of Martha's Vineyard. Natural History Press, Garden City, New York.

1971 A Typology and Nomenclature for New York Projectile Points. Bulletin No. 384, New York State Museum and Science Service, Albany.

Rockmore, Marlene
1979 Documentary Review of the Historical Archeology of the Cape Cod National Seashore. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Sanger, David
1973 Cow Point: An Archaic Cemetary in New Brunswick. Archaeological Survey of Canada Mercury Series No. 12. National Museum of Man, Ottawa.

Snow, Dean R.
1980 The Archaeology of New England. Academic Press, New York.

Soil Conservation Service
1980 Soils and Their Interpretations for Various Land Uses: Cape Cod National Seashore. Ms. on file, Headquarters, Cape Cod National Seashore, South Wellfleet, Massachusetts.

1982 Technical Guide Material, Section II: Soil Interpretations Records. Ms. on file, Barnstable County Conservation District, West Barnstable, Massachusetts.

Spiess, Arthur E.
1984 Faunal Identification Cards. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

1985 Cape Cod National Seashore Archeological Survey Faunal Remains. Ms. on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Staples, A.C. and R.C. Athearn
1969 The Bear Swamp Site = A Preliminary Report. Bulletin of the Massachusetts Archaeological Society 30 (3-4):1-8.

Strahler, Arthur N.
1966 A Geologist's View of Cape Cod. Natural History Press, Garden City, New York.

Thomas, Peter and Brian S. Robinson
1980 The John's Bridge Site: VT-FR-69: An Early Archaic Period Site in Northwestern Vermont. Department of Anthropology Report 28, University of Vermont, Burlington.

Tuck, James A.
1971 An Archaic Cemetery at Port au Choix, Newfoundland. American Antiquity 36:343-357.

White, Anta M.
1963 Analytic Description of the Chipped-Stone Industry from Snyders Site, Calhoun County, Illinois. In Miscellaneous Studies in Typology and Classification, pp. 1-70. Anthropological Papers No. 19. Museum of Anthropology, University of Michigan, Ann Arbor.

Wilmsen, Edwin N.
1974 Lindenmeier:A Pleistocene Hunting Society. Harper and Row, New York.

Winkler, Marjorie Green
1982 Late-glacial and Post-glacial Vegetation History of Cape Cod and the Paleolimnology of Duck Pond, South Wellfleet, Massachusetts. Institute for Environmental tudies, Land Resources Program, University of Wisconsin, Madison.

1985 A 12,000-Year History of Vegetation and Climate for Cape Cod, Massachusetts. Quaternary Research 23:301-312.

Wyatt, Ronald J.
1977 The Archaic on Long Island. In Amerinds and Their Paleoenvironments in Northeastern North America, edited by Walter S. Newman and Bert Salwen, pp. 400-410. Annals, Vol. 288. New York Academy of Sciences, New York.

Zeigler, John M., Sherwood D. Tuttle, Herman J. Tasha, and Graham S. Giese
1965 The Age and Development of the Provincelands Hook, Outer Cape Cod, Massachusetts. Limnology and Oceanography 10 (Supplement): R298-R311.

REPORTS OF THE DIVISION OF CULTURAL RESOURCES
North Atlantic Regional Office, National Park Service

The Division produces and prints reports on archeological, curatorial, historical, and historic architectural topics that identify, evaluate, document, and interpret cultural resources in National Park Service units of the North Atlantic Region. Some of these reports are of general interest for their presentations of substantive, bibliographic, technical, or methodological information. These are listed below. Those that are listed with an NTIS number are only available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151. Others are available from the Division of Cultural Resources, NARO, National Park Service, 15 State Street, Boston, MA 02109. Prices are listed.

Cultural Resources Management Studies

No. 1	Archeological Resource Study, Roger Williams National Monument. Public Archaeology Laboratory, Brown University, 1979.	NTIS PB81 185134
No. 2	Archeological Overview and Evaluation at Minute Man National Historical Park. Vernon G. Baker, 1980	NTIS PB81 185142
No. 3	Historic Resources Study, Jamaica Bay: A History. Gateway National Recreation Area, New York-New Jersey. Frederick R. Black, 1981.	NTIS PB81 226649
No. 4	Archeological Site Examination: A Case Study in Urban Archeology. Roger Williams National Monument. Patricia E. Rubertone and Joan Gallagher, 1981.	6.00
No. 5	Archeological Resource Study, Historical Archeology at Bunker Hill Monument. Boston National Historical Park. Thomas Mahlstedt, 1981.	NTIS PB83 186957
No. 6	Archeological Investigation at the Narbonne House. Salem Maritime National Historic Site. Geoffrey P. Moran, Edward F. Zimmer, Anne E. Yentsch, 1982.	7.00
No. 7	Historic Resource Study, A History of Fort Wadsworth, New York Harbor. Frederick R. Black, 1983.	4.00
No. 8	Chapters in the Archeology of Cape Cod, I. Results of the Cape Cod National Seashore Archeological Survey, 1979-1981 (2 volumes). Francis P. McManamon, editor, 1984.	7.50 Volume 1 9.00 Volume 2 15.00 Both Volumes
No. 9	The National Park Service in the Northeast: A Cultural Resource Management Bibliography. Dwight T. Pitcaithley, 1984.	7.00
No. 10	Celebrating the Immigrant: An Administrative History of the Statue of Liberty National Monument, 1952-1982. Barbara Blumberg, 1985	5.00
No. 11	Hoosac Docks: Foreign Trade Terminal. A Case of the Expanding Transportation System Late in the Nineteenth Century. Paul O. Weinbaum, 1985	4.00

(continued on back cover)

No. 12	The 1983 Excavations at 19BN281: Chapters in the Archeology of Cape Cod, II. Christopher L. Borstel, 1985	
No. 13	Chapters in the Archeology of Cape Cod, III: The Historic Period and Historic Period Archeology. Francis P. McManamon, editor, 1985	
No. 14	Inventory of Structures: Morristown National Historical Park. David Arbogast, 1985.	7.00
No. 15	The Scene of the Battle: Historic Grounds Report, Minute Man National Historical Park, Joyce L. Malcolm, 1985	3.00

Archeological Collections Management Project Series

No. 1	Archeological Collections Management at Salem Maritime National Historic Site. Alan T. Synenki and Sheila Charles, 1983.	4.00
No. 2	Archeological Collections Management at Morristown National Historical Park, New Jersey. Alan T. Synenki and Sheila Charles, 1983.	3.00
No. 3	Archeological Collections Management of the Great Island Tavern Site. Cape Cod National Seashore, Massachusetts. Alan Synenki and Sheila Charles, 1984.	3.00

Other Publications

Cultural Resources Inventory, Lowell National Historical Park and Preservation District: Report. Shepley, Bulfinch, Richardson and Abbott, Architects, 1980.	NTIS PB81 189169
The Archeology of Cape Cod National Seashore. Francis P. McManamon and Christopher L. Borstel, 1982. (pamphlet 16 pp.)	1.00